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Collective Review

THE PREVENTION AND TREATMENT OF INTESTINAL ADHESIONS

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ONE OF THE MAJOR UNSOLVED PROBLEMS which continues to confront surgeons throughout the world is the management of the patient with bowel obstruction secondary to intestinal adhesions. Almost every teaching hospital has several well-known patients who have had lysis of adhesions for the relief of intestinal obstruction more than a dozen times. The management of these particular patients poses a very serious problem for the attending surgeon, a problem that is often considered insoluble.

A large volume of literature has been published in the last several decades and various agents or methods for the prevention and treatment of postoperative adhesions have been advocated, but few, if any, of the reports have been substantiated by other investigators or have been incorporated into a standardized approach to this problem.

It is well known that from 70 to 90 per cent of the patients with obstruction secondary to adhesions have undergone previous abdominal operations, that these interventions were principally either gynecologic operations or appendectomies, and that almost all the obstructions are of the small bowel (8, 120).

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It is generally recognized that a large number of patients with intestinal obstruction due to postoperative adhesions will respond to conservative treatment such as intubation, suction, and supportive therapy. It is likewise widely accepted that unless evidence of recovery is prompt and unequivocal, operative intervention is imperative.

What is not clear, however, is what factors can be employed to prevent the original occurrence of postoperative adhesions and what can be done to prevent their recurrence once surgical intervention is necessary in the obstructed case. No one knows why extensive adhesions will develop in some patients after the smallest abdominal operation, such as an uncomplicated appendectomy, while there will be few, if any, adhesions in others after an operation as major as a total colectomy. Although these extremes are seen, the number and severity of adhesions do correlate with the extent of bowel handled and the amount of peritoneum that is denuded.

All adhesions do not cause intestinal obstruction. One patient with extensive adhesions may be completely asymptomatic throughout his lifetime while a single adhesion in another patient can lead to obstruction and strangulation of the bowel. If some method has been used to prevent

adhesions, and the patient has had no symptoms during a short follow-up period, this does not necessarily mean that the method was effective or that it will be useful in another patient. Because of this difficulty in properly evaluating clinical results many surgeons have turned to the laboratory. Here re-explorations can be carried out as desired, and the effectiveness of the method under study evaluated.

A study of the literature on the experimental aspects of this problem reveals that there is no uniform experimental design to test the various treatments which have been proposed. Most commonly, talc has been sprinkled on the bowel at laparotomy or injected through the abdominal wall. Many investigators have thought that since adhesions will develop in the control animals because of this foreign body, any treatment which prevents this adhesion formation would also be effective in humans. These are not parallel situations. Adhesions in humans are due primarily to peritoneal injury, usually traumatic or bacterial, and less commonly to foreign body reaction. The prophylactic treatment being tested may have no influence on the actual formation of adhesions, but if it promotes rapid absorption of the talc particles it will decrease the foreign body reaction and subsequent adhesions.

The ideal experiment is one in which massive adhesions are made, by any means, and later at a second laparotomy, they are divided. The treatment or substance being tested is then administered to determine its influence on the reformation of the divided adhesions. Under these conditions there is no question of other factors, such as absorption of foreign body, to detract from the validity of the experiment.

In 1942 Boys (14) published a comprehensive review of the literature on the prevention of peritoneal adhesions. He concluded that in addition to the prophylaxis afforded by minimizing operative trauma, the only supplementary measure of promise was heparin. Among the most prominent early agents proposed were lubricants, peptones, papain, trypsin, and amniotic fluid. The use of these and many other agents has also been reviewed by Krook (41). Although they held great promise initially, they have all been discarded.

Now, 17 years later, although many more agents and modes of therapy have been recommended, the solution to this problem is still wanting. In this review the authors propose to evaluate these newer modalities and to outline a plan of management of recurrent intestinal adhesions in the light of our current knowledge.

LYSIS OF ADHESIONS

The usual operative procedure for obstruction due to intestinal adhesions is surgical division of the adhesions. Experimental work by Lehman and Boys (50) demonstrated that in dogs repeated lysis of adhesions caused more adhesions to form each time: one-fourth again as many after one lysis and two-thirds again as many adhesions after a second lysis. There has been general agreement by others that this also occurs in clinical cases. The one dissenting report is that of Thomas, Greene, and Rhoads (111) who found that repeated lysis of adhesions in rats resulted in a decrease in the number of adhesions without any other treatment. However, this work was based on the division of only a few adhesions or a single adhesion, whereas Lehman and Boys were dealing with extensive adhesions.

Reichert, Gerbode, and Halford (87) found the use of the cautery to divide adhesions to be helpful in preventing reformation of adhesions in their series of dogs. They explained that division by coagulation left dead tissue on exposed surfaces and healing occurred beneath before separation of the eschar, thus preventing adhesion of the bowel loops. This procedure is more applicable to discrete fibrous bands than to adhesions holding large areas together.

The efforts which have been made to prevent intestinal adhesions, in addition to their simple division, have been directed toward interrupting or changing some part of the pathologic process which results in their formation. This process may be summarized briefly as follows: After injury to peritoneal surfaces, an exudate is formed. This exudate coagulates to form fibrin which causes adjacent surfaces to adhere. The fibrin may be removed during repair, but often the leucocytes and enzymes are not sufficiently concentrated to accomplish this. During organization blood vessels and fibrocytes migrate into this area and deposit collagen. A permanent adhesion is then formed.

Logically then, any method expected to be effective should be directed toward one or more steps in this sequence of events. These possible methods can be grouped together: first, attempt to limit the original peritoneal injury; second,

prevent coagulation of the exudate; third, keep surfaces from being in prolonged contact; fourth, remove fibrin after it is formed; and fifth, stop or slow down the proliferation of fibroblasts.

An additional approach to the problem is not directed toward preventing adhesions but rather toward preventing obstruction by using controlled adhesions. This approach consists of joining adjacent loops of small bowel together in a stepladder fashion to avoid kinking or angulation of the bowel and in turn avoiding obstruction.

PREVENTION OF INTESTINAL ADHESIONS BY LIMITATION OF ORIGINAL PERITONEAL INJURY

Trauma and reperitonealization. One of the basic principles in the prevention of adhesions has been the attempt to avoid trauma to peritoneal surfaces with the subsequent development of inflammation and exudate. There has been general agreement that the following should be avoided when possible: chemical and thermal trauma, sepsis, and mechanical trauma caused by improper retractors; excessive packing with gauze; use of dry gauze, unnecessary sponging, and mass ligatures; and the use of too large needles, sutures, and hemostats (14, 103, 106).

Although it was previously believed that all denuded areas of peritoneum should be closed by oversewing, this has been questioned in several recent reports. It was noted by Robbins, Brunschwig, and Foote (88) that in patients who had had extensive exenteration procedures for malignant conditions and in whom it was frequently impossible to cover large peritoneal defects, no particular trouble from postoperative adhesions occurred. They studied the problem in dogs. Four dogs in which the peritoneum was left open after laparotomy had no evidence of adhesions when examined later. In a group of 10 dogs large segments of peritoneum were excised. At exploratory operation several weeks later 4 dogs had adhesions while 6 had none. The authors believe that the adhesions in the former group were due to peritoneal infection and conclude from their experiments that denuded areas of peritoneum need not necessarily be closed.

Thomas and Rhoads (113) studied this same problem in rats and guinea pigs. In 28 rats an area of bowel was denuded of serosa. Eight of these (29 per cent) later had adhesions to this area. In 27 rats similar areas were stripped and then oversewn. In 20 (74 per cent) of these adhesions developed. A similar study in guinea pigs revealed that adhesions developed in 7 of 19 controls (37 per cent), but they developed in 18 of 21 (86 per cent) animals in which the serosa was oversewn.

Chester, Bell, and McCorkle (21) and Singleton, Rowe, and Moore (101) reaffirmed that any form of reperitonealization probably increases the incidence of adhesions. Williams (127) believed that infection was the most common cause of adhesions and that an adhesion will likely occur between surfaces when both are inflamed, but a raw area in itself will not cause adhesions. Attempts at peritonealization result in additional trauma to the subserosa and sepsis may be introduced by the additional manipulation.

In summary, experimental studies have demonstrated that peritonealization of areas denuded of serosa will not prevent adhesions but, on the contrary, will often result in more extensive adhesions. In addition, the number of adhesions produced will depend upon the amount of manipulation involved and whether there is any deviation from complete asepsis.

Sulfonamides. In the early 1940's the sulfonamides were thought to be one of the more promising substances for the prevention of adhesions. It was thought that this ability to prevent adhesions was due to their power to combat infection, rather than to any direct influence. Reports soon appeared, however, that suggested that the sulfa drugs might cause adhesions. Sutton (108) reported a clinical case of ruptured appendicitis in which sulfathiazole powder was placed in the peritoneal cavity at the time of appendectomy. The patient had a second operation for obstruction 2 months later and at that time extensive adhesions and granulation tissue were found where the sulfathiazole had been placed.

Harbison and Key (37) found that powdered sulfanilamide, sulfathiazole, and sulfadiazine did not tend to cause adhesions in rats. Different results were reported in the dog by Crutcher, Daniel, and Billings (27). They found that sulfadiazine produced much greater local reaction than sulfanilamide or sulfathiazole, and its absorption occurred more slowly. However, all three drugs produced adhesions and granulomas, particularly if lumps of the powder were used. If lumps were avoided, either by careful distribution of the powder or by using a suspension or solution, the reaction was much less.

Schäffer (90) reported 37 clinical cases in which sulfonamides had been placed in the peritoneal cavity and the patients had exploratory operations or were examined at autopsy. Dense adhesions and granulomas were found in only 1 patient. The remainder had only occasional filmy adhesions. Gärtner and Knörr (33) studied the effects of marbadal, a sulfonamide, in animals and found that it did not cause adhesions until ten times the normal dose of 0.14 gram per kilogram of body weight was given.

The use of powdered sulfonamides in the peritoneal cavity as a method of minimizing infection and in turn preventing intestinal adhesions has generally been abandoned. Indeed, the powder itself may contribute to an increase in the number of adhesions.

PREVENTION OF INTESTINAL ADHESIONS BY INHIBITING THE COAGULATION OF THE EXUDATE

Heparin. The role of heparin in the prevention of adhesions may be summarized as follows: There is a short period of time between the production of a peritoneal exudate and its subsequent coagulation with deposition of fibrin on injured serosal surfaces. Anticoagulants of various types should be effective in preventing this fibrin formation if it is assumed that the coagulation mechanism of both exudate and blood is the same. Supposedly, in the absence of fibrin, organization and subsequent adhesion formation cannot occur. Boys (14) has summarized several methods to prevent coagulation which will not be discussed here, namely, the dilution of all coagulation factors by large amounts of fluid, the use of citrates and oxalates to bind calcium ions, the use of hirudin as antithrombokinase, and the use of peptone solution as an antifibrinogen. All these methods are of historical interest only, since they have proved unsatisfactory. The two anticoagulants that are still being investigated in relation to adhesions are heparin and dicumarol.

In 1940 Lehman and Boys (47) reported their initial experiments. In rabbits, both mechanical damage and bacterial contamination of the peritoneum were used to produce adhesions. Saline solution and amniotic fluid did not protect against adhesions, but heparin solution, placed in the abdomen before closure and injected intraperitoneally on the next 2 days, prevented adhesions in all but 1 of 20 animals. In dogs, experiments were designed to simulate the problem of the patient with recurrent adhesions. Adhesions were produced and divided surgically 6 weeks later. At the time of lysis no further procedure was carried out in 10 dogs, saline solution was introduced in 5, amniotic fluid in 5, and heparin in 10, again during a 3 day period. The number of adhesions divided was then compared with the number which had reformed 4 to 6 weeks later. The control, saline, and amniotic fluid groups all had more adhesions reform than had been divided, an average of 157 per cent. There was a 26 per cent reformation of adhesions in the group receiving heparin. In addition, the character of the adhesions was markedly different. The bands were much thinner, lighter, and easier to separate in the heparin group than in the others.

Later in 1940 the same authors (48) reported a number of experiments in which they attempted to determine the optimum dose and length of time for the administration of heparin. They found that 1,000 units of heparin daily for three doses gave better results than larger doses for a shorter period of time. Extending the injections to 4 days did not improve the results.

Further experiments by Lehman and Boys (50) showed that repeated lysis of adhesions caused more to form each time in the control group and fewer each time in the group receiving heparin. After one lysis 128 per cent reformation occurred in control dogs and 33 per cent in those receiving heparin. After the second lysis 169 per cent of the control adhesions reformed and only 22 per cent reformed in the dogs being treated with heparin. Boys and Lehman then studied the effects of heparin in the presence of sulfonamides (16). Sulfanilamide solution administered with heparin once daily in uninfected dogs after lysis was not as effective as heparin alone in the prevention of adhesions. However, if the sulfanilamide and heparin solution was given twice daily then only 23 per cent of the adhesions reformed. They did not mention any animals that received heparin alone twice a day.

Bloor and associates (13) using heparin in rabbits concluded that the likelihood of adhesions developing was almost as great in those treated with heparin as in those treated with nothing, saline, or gelatin. They noted fibrin at the site of injury in those rabbits which died of hemorrhage during heparinization and believed, therefore, that heparin did not prevent the

formation of fibrin. They made no estimate of the density or strength of the adhesions present.

The use of heparin in rats was investigated by Chandy (19). He formed adhesions in his control group by the intraperitoneal injection of 3 per cent sodium hydroxide. The treatment group received heparin at the same time that the sodium hydroxide was injected. The animals were sacrificed and examined after 4 days. He concluded that even though heparin prevented coagulation of blood in the peritoneal cavity it did not prevent the formation of adhesions. Six of his 35 rats died of hemorrhage. This study supported earlier conclusions of Chandy and Rhoads (20) that the coagulation mechanism was not necessary for the formation of adhesions. This experiment does not parallel the clinical problem of recurrent adhesions because of the method employed to produce the adhesions.

Davidson (28) found in dogs that heparin, whether given in saline, gelatin, or Pitkin menstruum, and either applied directly to the peritoneum or given subcutaneously, was effective in decreasing the number and density of adhesions. The frequency of adhesion formation varied inversely with the prolongation of the clotting time. If the clotting time was maintained over 27 minutes for the first 24 hours no adhesions were noted.

Van Dyk (118) produced peritoneal injury in dogs by needle scarification of intestinal serosa in a gridiron pattern followed by the application of iodine to the traumatized area. The animals were examined for adhesions 6 weeks later. Of 10 control dogs 2 had minimal, 3 moderate, and 5 extensive viscerovisceral adhesions. Of 11 dogs treated with saline, 5 had moderate and 3 extensive adhesions and there were no adhesions in 3. Of 16 dogs treated with heparin for 3 days, adhesions formed in only 1, and they were of minimal extent. Of interest is the fact that adhesions to the incisional area of the abdominal wall were encountered equally in all three groups. However, the type of peritoneal injury produced does not resemble the clinical problem of large areas of bowel denuded of peritoneum. Perhaps the fact that all had adhesions to the incisional site indicates further that heparin is not as effective as it might seem from the aforementioned results.

Piccoli and Piscitelli (80) studied the use of heparin in rabbits, giving one dose at the time of the laparotomy at which adhesions were produced, and another dose 12 hours later. When examined 7 days later only 1 of the 8 animals had adhesions. This experiment, like many others, is subject to criticism because the substance being tested was applied before the initial adhesions were formed.

The first clinical studies on the use of heparin were reported by Lehman and Boys (49) in 1941. They gave 10,000 units of heparin in 300 cubic centimeters of saline intraperitoneally at the time of lysis. In addition, 5,000 units in saline were given by injection into the abdomen every 12 hours thereafter for six doses, a total of 40,000 units in 3.5 days. One of their 14 patients died of intraperitoneal hemorrhage. The longest follow-up on the surviving patients was 6 months; all were well. No additional patients have been treated with heparin by these authors (15).

Massie (58) reported 7 clinical cases in which patients were given heparin through a catheter left in the peritoneal cavity. The amount used was a total of 40,000 units given in divided doses within 36 hours. These patients had had one to three previous laparotomies for lysis of adhesions. In 2 of the patients laparotomy was performed again 5 months and 7 months later. It was found that the areas which had been freed and then treated with heparin were remarkably smooth, mobile, and without adhesions. There were no deaths; however, there was some difficulty with wound healing and bleeding. He concluded, "Until there are more clinical reports, we must consider the use of heparin to prevent obstructing adhesions as promising but unsettled."

Although they did not say how many patients had been treated with heparin, Lord, Howes and Jolliffe (53) mentioned 2 patients that died after its use.

Dicumarol. Studies on the use of dicumarol were reported in 1949 by both Davidson (28) and White (124). In Davidson's experiments dicumarol was given orally, starting 20 hours before operation. Four of his dogs (25 per cent) died of hemorrhage. He found a moderate reduction in adhesion formation; however, the adhesions were bulky and edematous. He thought that heparin and dicumarol used together did not prevent adhesions as effectively as heparin alone.

White (124) judged the effectiveness of dicumarol by estimating the "bare area" of bowel after lysis of adhesions and at the time of sacrifice after again dividing the adhesions. In his 6

control dogs the area of adhesions after lysis was found to be increased by 231 per cent. Dogs treated with dicumarol for 4 days with a prothrombin activity in the range from 7 to 60 per cent, were found to have only 25 per cent as many adhesions as previously. The adhesions which formed were thinner, elastic, and more easily broken than those in the control animals. There was no difficulty with hemostasis and wound healing. Four days of dicumarol therapy seemed to be as effective as longer periods.

Minge and Dennis (63) studied the effect of dicumarol after lysis of adhesions in dogs. Of the 8 animals given dicumarol 3 died of hemorrhage. Adhesions reformed to the same extent as before or were more extensive. The authors also studied the effect of dicumarol on the ability of the peritoneum to localize infection. There was no apparent difference between the dogs treated with dicumarol and the controls.

Although some investigators have reported that heparin was of no value in the prevention of adhesions, more experimental evidence has been presented in favor of heparin than against it. This has not been the case with dicumarol, since even more trouble with hemorrhage has been noted when it was used. While even the most enthusiastic investigators admit that heparin does not prevent postoperative adhesions, it does seem to be effective in decreasing their number and density. Clinical reports have been sparse. Three patients, of the 23 whose cases have been reported, died of hemorrhage. There have been no reports of the clinical use of heparin for the prevention of adhesions in the last 10 years. Apparently surgeons believe that the risks of hemorrhage from heparin outweigh the possible benefits in the prevention of adhesions.

PREVENTION OF ADHESIONS BY LIMITING PROLONGED CONTACT OF SURFACES

Lubricants. Another theory proposed was that, since adhesions cannot occur unless peritoneal surfaces are touching, some material should be interposed between them. Most of the substances advocated acted as foreign bodies and caused more adhesions rather than less. Few reports have appeared in recent years which advise the use of lubricants.

Behan (9) reported that he used a mixture of 95 per cent lanolin and 5 per cent boric acid to coat denuded peritoneal surfaces. He used this clinically in 30 cases of generalized adhesions. Twenty-six of these patients were free of symptoms from 1 to 20 years, while 3 were improved, and 1 died. However, there has not been any experimental work to confirm these clinical impressions.

The use of liquid human fat, rendered from lipomas or subcutaneous fat, as a lubricant to prevent adhesions has been advocated by Biermer (11) and by Schmorell (96). The authors are not aware of any experimental study of this substance.

Oxidized cellulose. Dmytryk (30) studied the use of oxidized cellulose to cover denuded areas of bowel with the hope that this substance might be of value in preventing adhesions. In his experiments on dogs he found that it was not effective in preventing the formation or reformation of adhesions.

Amnion. The search for a material to cover denuded bowel which would not act as a foreign body led Kubanyi (42,43) to try fresh human amnion. In 1955 he reported its use in 7 cases of recurrent adhesions with follow-up of 4 to 11 years. All patients were free of symptoms. The use of amnion required that two operations be performed at once: a cesarean section to obtain the amnion and the lysis of adhesions in a second patient in order to use the fresh membrane. He later found that amnion could be preserved by freezing and thereby avoided the problem of simultaneous operations.

Ten Berge and Tik Lok (109) reported their experiments with the use of preserved amnion to prevent adhesions in rabbits. They concluded that it had real value since no adhesions occurred when extensive peritoneal defects were covered with amnion.

Omental and mesothelial grafts. The use of omental and mesothelial grafts in the prevention of adhesions is not new but dates back to the early part of the twentieth century. However, there was little interest in their use until recently. McGettee (59) reported on a series of 15 patients who had remained well postoperatively after the use of omental grafts. None of these patients had multiple previous operations. Viggiano and Iacueo (119) reported 3 cases in which similar omental grafts were used. All 3 patients were well from 5 to 20 months later.

An experimental study on the use of free mesothelial grafts was reported in 1955 by Carver (18). He produced adhesions in dogs by

excision of an area of serosa and subserosa. At a second laparotomy the adhesions were separated, all scar tissue excised, and the denuded areas covered by free mesothelial grafts from omentum, mesentery, falciform ligament, or parietal peritoneum. The donor site was then closed. The areas were examined 4 to 6 weeks later and the extent and number of adhesions were noted. Of a total of 36 grafts 7 were completely free of adhesions. The only thick fibrous adhesions, 2 in number, were found in those cases in which the sutures holding the graft had pulled out. Six months after grafting a fourth laparotomy was performed. The fibrinous adhesions previously noted had disappeared. There were only three fibrous adhesions present, each of which could be explained by a technical error. This work is of interest because this is the only experimental study in which the status of the adhesions was determined as late as 6 months after formation.

Carver also reported the clinical use of free mesothelial grafts in 3 patients with good results. Each had been operated on only once, and the area of denuded peritoneum was small.

It would appear that the use of free omental and mesothelial grafts is an ideal method for covering localized areas of denuded bowel.

Early and increased peristalsis. Minge and Dennis (62) treated several patients with diathermy to the abdomen after lysis of adhesions and had the impression that this was helpful. In a effort to test this experimentally they used diathermy on 11 dogs after lysis of adhesions but did not use it on a similar control group. In the anesthetized dog they noted increased peristalsis and edema of the bowel. However, there was no difference in the extent of reformed adhesions in the two groups.

Another approach to the problem of encouraging early peristalsis was reported by Schiff, Goldberg, and Necheles (94). In their early experiments they compared the number of adhesions produced by talc in the peritoneum in two groups of dogs. The control group had 0.25 gram of talc sprinkled on the small bowel at laparotomy. Postoperatively they were given atropine, 0.5 milligram subcutaneously every 4 hours, and were fasted for 48 hours. The experimental animals had the same procedure but were given prostigmin methylsulfate, 0.5 milligram subcutaneously initially and 0.25 milligram every 4 hours. They were fed within 8 to 12 hours postoperatively. At exploration 4 to 6 weeks later the control group had an average of 17.4 adhesions while those receiving early feeding and prostigmin had an average of 5.1 adhesions, a reduction of 71 per cent. The authors postulated that the experimental regimen stimulated early peristaltic activity which in turn prevented adhesions. The experimental design, however, did not parallel the clinical problem, and it might be considered that early peristalsis hastened the absorption of talc, rather than acting on the adhesive process.

In 1950 the same authors (95) revised their experiments to test the reformation of adhesions after lysis. Adhesions were produced by talc. Six weeks later, at the time of lysis, the authors estimated the density of the adhesions and their number. A band 2 centimeters wide was counted as one adhesion, a band 4 centimeters wide was counted as two, and so on. Five control dogs were starved and given atropine while 6 others had early feeding and prostigmin. At autopsy 6 weeks later the control group had a reformation rate of 92 per cent while the adhesion reformation rate was only 33 per cent in the group in which peristaltic activity had been stimulated. It would be interesting to perform an experiment in which early feeding and starvation alone are compared. The fact that two variables were employed here, both drug and feeding, raises the question as to the effect of each.

Cone (22) has recently reported similar results. He produced adhesions by trauma to a measured area of bowel. He estimated both extent and density of adhesions and by adding them together obtained a semiquantitative expression. The average value of this expression for his 10 control dogs was 2.5. The 10 dogs that received 1 milligram of atropine every 8 hours for 3 days had an average adhesion value of 5.4. The 11 which had been given prostigmin, 1 milligram every 8 hours for 3 days, had an average of only 1.1, that is, the extent and density of adhesions in these dogs was much less than in the control and atropine groups.

The theory behind these experiments is that early peristalsis will not permit adjacent bowel surfaces to stick together and the adhesion process thus cannot begin. The theory seems logical, but the peristalsis must be early, if we accept Trompke and Seigner's (117) observation that mechanical force could separate adherent peritoneal surfaces for only the first 3 hours. After

that time separation usually occurred in the subserosa, leaving a denuded area of bowel. How soon peristalsis can be effectively stimulated after abdominal surgery is not known.

Stimulation of peristalsis by means of prostigmin and early feeding appears, from all experimental data, to exert a moderate but definite preventive effect on the formation of adhesions. Its use in clinical cases, however, has not been reported.

PREVENTION OF INTESTINAL ADHESIONS BY REMOVING FIBRIN AFTER ITS FORMATION

Sodium ricinoleate. Seeley (98) experimented with solutions of the soap sodium ricinoleate within the peritoneal cavity. In control experiments he found that this material alone led to a mild peritonitis in monkeys and was not fatal. A few adhesions followed its use. In rabbits he compared adhesions after trauma to the cecum in controls to those receiving gum acacia, amniotic fluid, or ricinoleate intraperitoneally. There was no difference between the controls and the groups treated with gum acacia and amniotic fluid, but the soap solution group had fewer adhesions. His explanation of this was based on the observation that sodium ricinoleate led to a definite early fibrinous exudate in every case, but that after 7 days no adhesions were formed. Therefore, its action could not be explained on an anticoagulant basis. He believed that it acted by increasing the amount of exudate with all its cellular, fluid, and enzymatic elements, which, in turn, removed most of the fibrin that had formed.

Streptococcal metabolites. Wright *et al.* (128) had good results in preventing traumatically induced intestinal adhesions in rabbits by employing large doses of streptokinase and streptodornase. They carried out similar studies on dogs, however, and found that in this animal streptokinase and streptodornase had little effect on the prevention of intestinal adhesions.

Luttwak, Feldman, and Neuman (55) found in rats that streptokinase-streptodornase prevented talc granulomas and intestinal adhesions fairly well when they were given at the same time as the talc. However, these experiments are inconclusive since the drugs can be correctly evaluated only by applying them after division of the adhesions.

Gustavsson and his associates (36) found that streptokinase alone had no effect on the formation of adhesions, but that plasmin and streptokinase prevented adhesions in 62 per cent of the animals whose peritoneum had been scraped with a grater. They stated that plasmin is present in the blood as a proenzyme, plasminogen, which can be slowly activated by a kinase in the tissue detritus. They also stated that in the first experiments only the activating kinase was used, which presupposes the presence of adequate amounts of available plasminogen, capable of being activated to produce fibrinolysis.

Sherry, Callaway, and Freiberg (100) found in dogs in which experimental peritonitis had been produced by a grater, that the intravenous injection of streptokinase alone in large doses or a mixture of smaller amounts of streptokinase plus a partially purified human plasminogen preparation, prevented or modified the development of postoperative adhesions.

While there is some experimental data suggesting that streptococcal metabolites are effective in the prevention or modification of intestinal adhesions, the results are conflicting and further investigation is necessary. The authors are unaware of any reports of the clinical use of streptococcal metabolites.

Hyaluronidase. Hyaluronidase is an enzyme with the property of hydrolyzing hyaluronic acid, which is one of the polysaccharides that constitutes the intercellular ground substance. When hyaluronidase was employed intraperitoneally in an effort to increase the absorption of fat, it was noted that few adhesions occurred as compared to the number of adhesions found in animals in which fat alone was administered (89). Such observations led to experimental studies on the effect of hyaluronidase on adhesions.

Chandy and Rhoads (20) found in experiments on rats that hyaluronidase prevented the formation of traumatically or chemically induced adhesions in 60 per cent of their animals. They stated that the coagulation mechanism is not necessary for the formation of adhesions and that the process cannot be stopped by heparin. They thought that hyaluronic acid must play some role in their formation.

Stoppelman (107) recommended that hyaluronidase solution be given intra-abdominally in 6 treatments 24 hours apart after freeing of adhesions. He believed that adhesions were prevented by the suppression of the fibroblast but that repeated administrations were necessary because

the fibroblast did not make its appearance until the third to fifth day after injury. In his experiments he found that six such doses of 2,000 units of hyaluronidase uniformly prevented adhesions produced by mechanical trauma or by talc whereas all the controls had adhesions. However, again the experiments were not well designed, since the hyaluronidase was introduced at the same time as the agent producing the adhesions, rather than the effect of hyaluronidase being tested on surgically divided adhesions.

Thomas *et al.* (112) repeated their experiments on the influence of hyaluronidase on the formation of intraperitoneal adhesions in the rat and could not confirm their previous results.

In 1951 Connolly and Richards (24,25) reported that hyaluronidase administered topically in moderate amounts in dogs will decrease the number and character of adhesions after they have been surgically divided and, in large dosage, will completely prevent their reformation. The same authors reported the absence of recurrent intestinal obstruction from adhesions in 12 of 14 patients in whom hyaluronidase was employed topically. Their follow-up was 1 year. In 1953 Connolly (23) repeated his experiments on the effect of hyaluronidase on peritoneal adhesions. Adhesions were produced by talc and were freed roughly so that massive raw bleeding areas were created. In a group of control dogs in which no intraperitoneal agent was introduced, massive thick adhesions were found upon re-exploration 1 month later. In another group of dogs hyaluronidase was applied topically to these raw areas and also instilled into the peritoneal cavity as it was closed. One month later re-exploration was carried out and while many adhesions were found in most of the dogs, they were fewer in number and of a much filmier consistency than those found in control animals.

Wilder (126) instilled hyaluronidase through the abdominal wall of rats after talc had been introduced to produce adhesions. He found no difference in the reformation of adhesions; however, the dosage of the drug was small and the drug was not applied topically. Myburgh (65) stated that on the basis of his experiments in rabbits only hyaluronidase appeared to be effective in the prevention of intestinal adhesions. Craig and Bianchi (26) found in their experiments on rats that when hyaluronidase was given in large doses over long periods of time it reduced the density of adhesions but not their number.

Nagel (66) has employed hyaluronidase intraperitoneally in 12 patients with recurrent obstruction due to adhesions. The agent was administered topically at the time of lysis of the adhesions. The dosage was 37,500 units of hyaluronidase dissolved in 20 cubic centimeters of saline. There has been no recurrence of intestinal obstruction in these patients followed up from 5 to 10 years.

While hyaluronidase does not completely prevent recurrent intestinal adhesions in experimental animals it does reduce the number of adhesions and particularly their density. Adhesions found after its experimental use are filmy and less fibrous in character than those in controls. Clinical results have been very promising.

PREVENTION OF INTESTINAL ADHESIONS BY INHIBITION OF FIBROBLASTIC ACTIVITY

ACTH, cortisone, and hydrocortisone. With the clinical introduction of ACTH and cortisone it was noted that these agents were capable of decreasing the amount of exudate and granulation tissue in open wounds (3,86,105). This observation led investigatiors to test the effectiveness of these drugs in the prevention of recurrent intestinal adhesions. Beamer (7), Ducommun (31), and Odell (78) found that ACTH and cortisone decreased the formation of adhesions in rats. However, the drug was administered at the same time the talc was introduced to produce adhesions. Lyall (56) performed similar experiments on guinea pigs with the same good results. Cortisone was found to be effective in preventing talc induced adhesions in dogs when given concurrently with the talc (54,67,91,92,93).

None of these investigators, however, tested the effectiveness of ACTH and cortisone on surgically divided adhesions. The work of Policard and Tuchmann-Duplessis (82), showing that ACTH causes rapid absorption and dissemination of intraperitoneal silica particles, suggests that the effectiveness of cortisone in the aforementioned experiments is due to its ability to promote the rapid absorption of talc.

Beamer, Friedman, and Chu (7) found in mice that the repeated subcutaneous administration of cortisone only delayed but did not suppress the formation of abdominal adhesions due to the intraperitoneal injection of talc. The animals were examined for adhesions over a period of 6 weeks. Hubay, Weckesser, and Holden (40) found that cortisone did not completely prevent

adhesions in animals in which the serosa was denuded, but that the adhesions were in general less extensive and less dense when cortisone was used.

Ammitzbøll (2) reported that in experimental studies hydrocortisone prevented talc adhesions and that it decreased but did not completely prevent the reformation of surgically divided adhesions. In Zachariae's (129, 130) experiments, hydrocortisone appeared to have an inhibitory effect on adhesions when administered at the same time that the serosa was injured. He noted also that it had a less marked inhibition on the reformation of surgically separated adhesions. DeSanctis, Schatten, and Weckesser (29) found in dogs that hydrocortisone administered topically resulted in a reduction in the number of adhesions and that they were filmy and easily separated.

Gurd (35) reported a case of a 19 year old girl in whom marked recurrent intestinal adhesions developed in spite of the parenteral administration of cortisone for 2 weeks after the surgical division of adhesions.

The adrenocorticoids appear to prevent talc induced adhesions, possibly by increasing the absorption of the talc. On the other hand, what little investigation has been carried out on their effect on surgically divided adhesions seems to show that while the adhesions are not completely prevented they are fewer in number and of a filmier consistency. In many of these experimental studies the presence or absence of adhesions was judged within 6 weeks. The results in such experiments are open to question because of the demonstrated ability of cortisone to delay the formation of adhesions. If one is to administer the corticoids, their tendency to delay wound healing must also be remembered.

PREVENTION OF THE COMPLICATIONS OF INTESTINAL ADHESIONS BY CONTROL OF THEIR CONFIGURATION

Plication. The fact that no satisfactory substance or operative technique that would prevent peritoneal adhesions was known led Noble to develop his method for producing controlled adhesions (68–76, 121). The technique consists of joining adjacent loops of small bowel together in a stepladder arrangement by suture of the mesentery. Although first described in 1937, this method was not widely noted until 1949 when Lord, Howes, and Jolliffe (53) described its use in 3 patients. The following experimental studies on plication have been reported.

Weckesser, Lindsay, and Cebul (122) created talc adhesions in 5 dogs. Lysis was later performed and plication of the small bowel was carried out. They studied the time required for barium to travel from the stomach to the cecum. Before adhesions were created, this transit time was from 45 to 150 minutes (average 88 minutes). After plication it was from 90 to 188 minutes (average 138 minutes). At autopsy, performed from 4 to 6.5 months later, they found no evidence of obstruction.

Martin and McGarity (57) performed plication in 11 dogs. At autopsy, from 1.5 to 9 months later, no perfect results were found. Many sutures had failed to hold, leaving holes through which loops of intestine could pass. While undesired adhesions occurred the bowel adhered properly in areas of inflammatory change or bowel denuded of its peritoneum. This corresponds more to the problem as encountered clinically. They stated that the dismantling of old chronic adhesions and the freeing of the small intestine in preparation for plication was quite a formidable procedure and that it should be undertaken only after due consideration of the risk involved.

Many clinical reports of the use of plication have appeared. In 1950 Noble (73) stated that he had treated 260 patients for extensive adhesions by lysis followed by plication, and that 2 had died. None of the others had recurrent obstruction. Follow-up varied from 1 to more than 20 years. Seabrook (97) reported 7 cases of recurrent obstruction due to adhesions. One patient died after lysis without plication. The other 6 were well after plication, with follow-up from 4 months to 1.5 years. Owen and Stone (79) treated 14 patients who had obstruction due to adhesions with plication. One died of peritonitis but the others were all well from 6 months to 10 years later. In 1951 Smith (104) listed his results with plication in 5 cases of intestinal obstruction. He had good results in 4. The fifth patient had an episode of obstruction 4 months postoperatively and peritonitis and death followed when a cotton suture pulled out of the distended bowel. As a result of this he recommends the use of absorbable sutures to plicate the bowel. Lord (52) reported 11 cases of complete plication of the small bowel in a

group of patients who had had on the average four previous operations for lysis of adhesions. Five were narcotics addicts. Follow-up was from 2 to 56 months with an average of 24 months. Six had excellent results. Two had good results; 1 of these had transient abdominal cramping and the other, a narcotic addict, had simulated attacks of obstruction without objective evidence. One had a fair result; in this patient the upper two feet of jejunum had not been plicated and obstruction later developed. Two had poor results. One of the poor results was the case of Smith's in which the patient died after a suture pulled out of the bowel and leakage led to peritonitis. The other poor result was a case in which 000 catgut was used for the plication. Obstruction developed 2.5 months later and at the time of exploration it was found that most of the bowel had become free again. Replication, using interrupted cotton sutures, was then performed and the patient had no further difficulty.

These last two cases demonstrate the controversy about the proper suture material. Noble (75) recommended any available suture, but preferably 00 plain catgut, used in continuous fashion in the mesentery and the mesenteric border of the bowel. He stated that it was necessary to hold the adjacent surfaces together only for a short time for them to adhere. Interrupted, nonabsorable sutures were recommended by Lord (52) because of his case in which the loops of bowel had separated. It seems advisable to avoid placing any suture through the full thickness of the bowel. Barron and Fallis (5) state that the procedure is greatly simplified by placing three key sutures of interrupted silk at the start of each loop plication. The first is placed near the base of the mesentery while the second and third are placed in the mesentery near the bowel wall at each end of approximately eight inch intestinal loops. The mesentery then is approximated by interrupted sutures between the three key points.

Quenu and Thomeret (85) reported 10 cases of plication with good results, again without a long term follow-up. In the 10 clinical cases of Weckesser, Lindsay, and Cebul (122) with follow-up from 6 to 21 months, 5 excellent results were reported. In the remaining cases the results were good in 1, fair in 2, and poor in 2. The 2 patients with poor results had marked postoperative pain but no evidence of obstruction. Poth, Lewis, and Wolma (84) were enthusiastic about the Noble operation. Of the 3 cases of recurrent obstruction in 47 patients 2 were due to carcinoma and 1 to volvulus of an unplicated area of bowel. Again the follow-up was short.

Barron and Fallis (5) stated that of 40 cases of plication at the Henry Ford Hospital plication of the small bowel was complete in 17. All these patients had had at least three previous laparotomies and one had had twenty-two. In their follow-up of from 6 months to 5 years the only complications found were in 4 patients in whom duodenal ileus developed postoperatively. They thought this was due to the weight of the plicated bowel transmitted to the duodenum by traction of the superior mesenteric vessels. They remarked that the principal pitfall is that one might not plicate enough of the small bowel. Interrupted silk sutures were used in the mesentery in these cases, but not used in the bowel. Many other reports of small series of plications (1, 4, 6, 10, 12, 17, 32, 38, 39, 44, 45, 46, 51, 60, 61, 64, 77, 81, 83, 99, 102, 110, 114, 115, 116, 123) have appeared in the last few years. These reports total 168 cases. The average recurrence rate of obstruction after plication as reported by all authors, excluding Noble, is 12 per cent.

White (125) described a method of producing controlled adhesions in a different way. He used a long intestinal tube as a splint to prevent sharp kinking of the small bowel. Of 14 patients followed up from 1 to 6 years, recurrent obstruction developed in 2.

The results of plication for recurrent intestinal adhesions as reported have generally been good. Although Noble reports a recurrence rate of less than 1 per cent the over-all incidence of poor results as reported by other authors is 12 per cent. It should be remembered that plication itself is a major undertaking and should therefore be reserved for those difficult cases in which more conservative measures have failed. The most satisfactory results can be expected when the entire jejunum and ileum are plicated.

SUMMARY AND CONCLUSIONS

The methods of treatment which appear to decrease the number and extent of adhesions include heparin, free omental and mesothelial grafts, stimulation of early peristalsis, hyaluronidase, and possibly ACTH, the corticosteroids, and the streptococcal metabolites. There are

fairly serious objections associated with some of these methods. Postoperative hemorrhage and death have followed the intraperitoneal use of heparin. Free omental and mesothelial grafts may be successful when used to cover limited defects, but are not practical in the case of extensively denuded peritoneum. Early stimulation of peristalsis is not harmful in the intact intestine, but probably should not be used in the presence of an anastomosis. ACTH, cortisone, and hydrocortisone may have some value in the prevention of adhesions, but there is good evidence that this effect is more a delay in formation than true prevention. The side effects of corticosteroids of course should be kept in mind. While the streptococcal metabolites have shown promise in the experimental animal no clinical report of their use has appeared.

Clinical studies indicate that the plication method of Noble which produces adhesions in a controlled pattern is of much value. Most of the cases reported in which there was recurrent obstruction were those in which the plicated bowel failed to stay together or where not enough small bowel was included in the plication.

If some substance were available that was uniformly effective in preventing adhesions and that had little or no toxic side effects, then it would seem likely that such treatment should be used each time the peritoneal cavity is opened. However, in our present state of knowledge, the methods that we have are probably better reserved for the patient with intestinal obstruction due to adhesions.

There is no general agreement in the medical literature about the management of the patient with recurrent intestinal adhesions and obstruction. A logical method for the surgical management of the patient with adhesions may be outlined as follows:

1. The basic surgical principles of gentle handling of tissues and strict asepsis should be observed.

2. Adhesions should be divided by cautery when possible.

3. Small peritoneal defects should be covered by grafts of mesothelium from omentum or mesentery.

4. Large peritoneal defects should be left alone.

5. Hyaluronidase solution should be applied intraperitoneally to denuded and traumatized areas.

6. If no anastomoses are present the bowel should be stimulated toward early peristalsis by drugs and early feeding.

7. In the patient with severe recurrent adhesions, or in one in whom the aforementioned methods have been ineffective, intestinal plication is probably the most effective therapy available.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Transplantation of the Parotid Duct for Xerophthalmia. FRANKLIN L. ASHLEY, AMOS N. SCHWARTZ, BRADLEY R. STRAATSMA, and JAMES C. FORD. *Am. Surgeon*, 1959, 25: 815.

TOTAL XEROPHTHALMIA often follows trachoma, exfoliative dermatitis, and ocular pemphigus. Management by means of topical instillation of artificial tears, administration of vitamin A, transplantation of mucous membrane, tarsorraphy, or occlusion of the lacrimal puncta has often failed to solve this problem. A procedure that has been described in Russian and Chinese literature, and was first described in the American literature by Bennett and Bailey in 1957, has proved successful in relieving the xerophthalmia. The technique consists in exposing the parotid duct and transplanting it to the inferior cul-de-sac of the eye. A cuff of the mucous membrane surrounding the duct orifice is used to elongate the channel. Artist's drawings illustrating the procedure are included in the article.

This method was used in 3 cases by the authors who report very satisfactory results.

—*Carl Schiller, M.D.*

Intracavernous Aneurysms of the Internal Carotid Artery. S. P. MEADOWS. *Arch. Ophth.*, Chic., 1959, 62: 566.

INTERNAL CAROTID ARTERY ANEURYSMS arising within the cavernous sinus behave differently from those arising elsewhere in the skull because they are encased in venous blood and restrained by a dural sinus. Rupture is uncommon and when it occurs the bleeding is into the venous sinus rather than into the subarachnoid space from which a 40 to 50 per cent mortality would be expected. Rupture occurs early and generally without warning symptoms. This well illustrated article presents the author's experience with 15 cases of unruptured aneurysm which have been followed up for several years.

Fistulous carotid-cavernous aneurysms are differentiated by their frequent relation to trauma, their abrupt onset, the audible cephalic murmur, and the exophthalmos developing suddenly over a few days or gradually over a period of some weeks. Such fistulas generally produce lid edema, chemosis, paralysis of the sixth nerve, or rarely bilateral ophthalmoplegia and sometimes bilateral exophthalmos.

Aneurysms within the cavernous sinus usually occur in females past midlife. The onset is often insidious, frequently painful, and generally accompanied by extraocular muscle paralyses beginning usually with the sixth nerve. Eventual involvement of the third nerve and a small pupil is the rule. Trigeminal loss is frequent but often begins years after the onset of symptoms. Visual failure is due to optic nerve compression. Exophthalmos is not associated with chemosis or congestion, and cephalic murmur was present in only 2 of the 15 patients.

Prognosis in relation to the aneurysm is encouraging but death may occur from cardiac failure or cerebrovascular accident. Roentgenograms generally show curvilinear calcification developing over several years and accompanied by local bone erosion. Percutaneous arteriography is essential to finite diagnosis, and treatment by common carotid artery ligation should be carried out, as in cases of carotid cavernous fistula, when there are adequate cross flow studies. Internal carotid artery ligation in 2 cases produced hemiplegia.

—*Arthur H. Keeney, M.D.*

Bacterial Corneal Ulcers. T. SUIE, M. M. BLATT, W. H. HAVENER, S. A. SROUFE, and P. BALSTAD. *Am. J. Ophth.*, 1959, 48: 775.

BACTERIOLOGIC CULTURES and sensitivity studies are recommended for all cases of corneal ulceration. Infections of the cornea with Proteus vulgaris are rare, but the authors report 2 cases and mention a third. Gram-negative bacteria are being isolated with greater frequency in ocular infections. Because of the variable susceptibility of gram-negative bacteria to antibiotics, the causative agent should be isolated and its sensitivity to antibiotics determined.

—*J. Jack Stokes, M.D.*

Strabismus Fixus. ALFREDO VILLASECA. *Am. J. Ophth.*, 1959, 48: 751.

ACCORDING TO THE AUTHOR strabismus fixus, whether congenital or acquired, is not due to primary fibrosis of the medial rectus muscles, but is a result of secondary contracture of these muscles after paralysis of the lateral rectus muscles. A case of strabismus fixus which developed in a 20 year old patient after cerebral trauma is presented. A surgical technique to lengthen a fibrotic muscle using bridle sutures is described. After a medial rectus muscle is lengthened for strabismus fixus, a conjunctival graft is necessary to lengthen the conjunctiva, since this is also shortened in strabismus fixus.

—*J. Jack Stokes, M.D.*

Lens Surgery in Marfan's Syndrome. DANIEL KRAVITZ. *Arch. Ophth.*, Chic., 1959, 62: 764.

MARFAN'S SYNDROME is a hereditary condition which is manifested by kyphoscoliosis, new bone formation, and characteristically by dissecting aneurysms of the aorta. It results from defective production or excessive destruction of chondroitin sulfate, an important ingredient of connective tissue.

When dislocated lenses are also present, vision is usually very poor so that difficulty is experienced at school and in the normal physical activities of childhood. As the lens shifts the refraction changes so that frequent changes in the correcting lenses are needed.

Whether and when to interfere surgically are debatable. The preponderant opinion appears to be avoidance of surgery unless it is absolutely necessary, because discission is a traumatic operation; multiple discissions are much more so. Vision and even the eye itself may be lost as a result of detachment of the retina, glaucoma, and/or iridocyclitis.

The author, however, is of the opinion that surgery should be performed early. He supports his views by his experience with eight eyes in 4 cases, 3 of which occurred in one family. He has adopted the following surgical procedure to avoid unnecessary movement of the lens and to do a generous capsulotomy: He spears the lens from one side with a Ziegler needle and cuts it with another needle from the other side. First the cutting is done toward the needle which is being used as a spear; then the second needle is used as a spear, and the first is used to cut with.

Glaucoma and detachments after this type of surgery do not occur more frequently than in nonoperative cases.

The author disagrees with those who advocate no surgery as long as these handicapped children are able to get around. If surgery is postponed serious complications such as anterior dislocation and cataract develop; these complications require extraction rather than discission with resultant failure because the vitreous is degenerated.

It is concluded that discission should be performed early if the dislocated lens is causing visual difficulties, in order to permit development of the child, mentally, socially, and educationally.

—*Joshua Zuckerman, M.D.*

Neptazane in Glaucoma, a Preliminary Clinical Report. D. H. COOP. *Brit. J. Ophth.*, 1959, 43: 602.

NEPTAZANE is a sulfonamide derivative chemically similar to diamox. It is a carbonic anhydrase inhibitor, but it is active in smaller and less frequent doses than diamox.

Fourteen cases are presented. Doses of 125 to 250 mgm. daily brought about a reduction in tension. In simple glaucoma long term treatment with neptazane might be helpful because of the smaller dosage possible. In acute narrow-angle glaucoma diamox was thought to be a better drug because the latent period of neptazane is too long, 3 to 5 hours.

Neptazane is absorbed slowly from the alimentary tract. It penetrates into the aqueous more readily than diamox, and is excreted more slowly. The side effects are less severe with neptazane than diamox.

—*Earl H. Merz, M.D.*

Observations on the Facility of Aqueous Outflow in Closed-Angle Glaucoma. WALLACE S. FOULDS. *Brit. J. Ophth.*, 1959, 43: 613.

IN CLOSED-ANGLE GLAUCOMA the darkroom test may be followed by a rise in ocular tension and a fall in the facility of aqueous outflow. It was thought that a fall in the facility of outflow was a more reliable and more delicate test than was the elevation of tension.

In this work 42 normal eyes and 97 eyes with closed-angle glaucoma were subjected to the darkroom outflow test. The normal eyes showed no significant change in the facility of outflow in a darkroom. There was a significant fall in the facility of outflow in 67 per cent of the glaucomatous eyes. At the same time only 30 per cent of the eyes showed a rise in ocular tension of more than 8 mm. Hg.

It is now accepted that in closed-angle glaucoma there is an abnormally narrow angle which remains open and functions well until a provocative situation closes it and precipitates an acute attack of glaucoma.

The results of this darkroom test suggest that partial obstruction of the angle may exist even in the presence of normal ocular tension. The darkness increases the angle closure. —*Earl H. Merz, M.D.*

The Repair of Full Thickness Eyelid Defects with Special Reference to Malignant Lesions. VARAZTAD H. KAZANJIAN and ARAM ROOPENIAN. *Plastic & Reconstr. Surg.*, 1959, 23: 262.

THE AUTHORS discuss the repair of full thickness loss of the eyelid. Although such defects sometimes result from congenital conditions or trauma, they are most commonly the result of resection of basal cell carcinoma. The objectives in the repair of eyelid defects are (1) to protect the globe with a functional eyelid and (2) to supply a cosmetically acceptable lid.

In most defects, one is able to supply sufficient conjunctival tissue from the immediate vicinity of the defect or from the homolateral lid. In large restorations a pedicled skin flap from the temporal region or the median section of the forehead may be used to supply a skin covering.

In the repair of subtotal full thickness defects, direct approximation of the wound edges is sometimes sufficient. However, if there is any tension of the lid, a horizontal incision extended laterally from the outer canthus, mobilizing the skin and freeing the tarsus palpebrarum from the external canthal ligament, will give relaxation and allow the lateral segment of the lid to be easily advanced medially. The steps in the repair are very nicely illustrated in the article.

In the repair of total loss of the eyelids, the authors use the Landolt-Hughes operation with modification to suit the individual case. This operation is performed by making a horizontal incision through the tarsus palpebrarum just inside the normal lid margin, splitting the lid into an outer and inner layer. The outer layer consists of the lid margin, with its lashes, skin, and orbicularis oculi muscle. The inner layer is composed of the conjunctiva with most of the tarsal plate. This inner layer forms a broad flap which is advanced and approximated to the cut edge of the remaining bulbar conjunctiva of the opposing lid. The free edge of the outer layer of lid is permitted to assume its nearly normal position and the remaining

raw area is covered by a full thickness postauricular graft. Occasionally a pedicled flap of skin from the opposing lid, temporal region, or forehead is used.

Tearing occurs in cases in which the lower canaliculus is sacrificed. In the repair of this complication the authors have had occasional success with a Toti-Mosher type of operation, making an adequate opening into the nasal cavity from the inner canthus, and passing a 00 nylon suture through this opening into the nose and out through the nostril. A loop is made which may be moved up and down by the patient, and which is kept in position long enough to establish permanent drainage. —*Frank W. Pirruccello, M.D.*

Dacryocystorhinostomy with Wire Fistulization. IRA A. ABRAHAMSON, SR., and IRA A. ABRAHAMSON, JR. *Am. J. Ophth.*, 1959, 48: 769.

THE SURGICAL TECHNIQUE for dacryocystorhinostomy using a No. 20 stainless steel wire for fistulization is given in detail. The wire is passed through the lower canaliculus and the saccus lacrimalis into the nostril and is tied over the cheek. It is left in place for 21 days. The purpose of the wire is to prevent closure of the fistula between the saccus lacrimalis and the nostril. —*J. Jack Stokes, M.D.*

EAR

Certain Problems in Tympanoplasty. FRED R. GUILFORD. *Ann. Otol. Rhinol.*, 1959, 68: 838.

THE AUTHOR first emphasizes that the full range of tympanoplastic procedures requires familiarity with a number of otosurgical techniques on the part of the surgeon and can be mastered only gradually. Infections limited to the middle ear may be controlled conservatively in the absence of cholesteatoma and, after the ear has been dry for 4 to 6 weeks, a type 1 or 2 procedure performed. If mastoid infection persists, a two stage procedure is recommended; first, a simple or modified radical mastoidectomy and later a type 1 or 2 procedure is performed. In the presence of cholesteatoma and minimal mastoid and middle ear infection a one stage procedure may suffice; but if there is active middle ear or mastoid disease a radical mastoidectomy is completed first and a tympanoplastic reconstruction carried out later after the ear has been clean and free from infection for at least 8 weeks. Thorough audiometric examination is always necessary, including the "patch test" and bone probe tests when feasible.

Tests of tubal function may not be relied upon absolutely; they should be accompanied by thorough examination of the nose and throat, and elimination of all infection therein, but the true state of the eustachian tube may still not be clear until after a tympanoplasty has been attempted. Skin grafts should be at least three-fourths split thickness and all care should be taken to prepare an adequate bed free from squamous epithelium. Folds in the graft should be avoided but it should be remembered that the graft will contract as it takes and, if it has been applied too tightly, may pull itself away from the ossicles. Packing should provide adequate pressure but not prevent circulation in the graft. Plastic prostheses may be used to provide the necessary link between the mobile footplate and the graft. —*John R. Lindsay, M.D.*

NOSE AND SINUSES

Epithelial Papillomas of the Nasal Cavity and Sinuses. J. L. VERNER, T. A. MAGUDA, and J. M. YOUNG. *Arch. Otolar.*, Chic., 1959, 70: 574.

EPITHELIAL NASAL PAPILLOMAS are uncommon and, because of their tendencies toward recurrence and malignancy, should be distinguished from ordinary nasal polyps. Ten cases occurring in a large hospital in more than 10 years, as compared to 353 mucous nasal polyps, underlines their relative rarity.

The cause of these papillomas has not been definitely determined, but they are hyperplastic lesions tending toward multiple recurrence and, rarely, erosion through the bone into the cranial cavity by pressure. The possibility of malignant transformation demands adequate treatment and frequent rechecks. The best results have been obtained by surgical excision followed by radiation and frequent follow-up examinations. —*Ernest D. Bloomenthal, M.D.*

The Role of the Nasofrontal Suture in Rhinoplasty. HARRY NEIVERT. *Arch. Otolar.*, Chic., 1959, 70: 696.

THE IMPORTANCE of the nasofrontal suture is not referred to in the literature on rhinoplasty. The nasofrontal suture is a finely serrated suture which forms a natural cleavage line for the delimitation of the upper part of the bony nasal dorsum. A knowledge of the anatomy of this area has made it possible to develop a simple technique which facilitates surgery of the bony nasal dorsum.

The operation is carried out under local anesthesia. A solution of 10 per cent cocaine and epinephrine is applied topically, followed by the injection of procaine into the operative area.

The objectives of the technique are: first, to remove in one piece and with minimal trauma to the surrounding tissues a central wedge of bony dorsum including the nasal bones, part of the solid angle (the upper thickened end of the nasal bones), and a part of the septum, which is simultaneously cut at a lower level than the lateral walls. The second objective is to carry out the lateral osteotomies, with a simple osteotome, in such a way that the entire lateral mass of the nasal bone and nasal process of the maxilla is separated in one piece, without comminution of bone or deposition of bone dust.

Three instruments especially designed for this operation are discussed and illustrated. The author claims that operative procedures based on the natural cleavage lines, and involving the use of specially designed instruments, ensure easier performance and good results with less trauma, less edema, less bleeding, and a shorter healing period.

—*John R. Lindsay, M.D.*

MOUTH

Results of Treatment of Squamous Cell Carcinoma of the Anterior Part of the Tongue. JOHN B. ERICH and LYLE V. KRAGH. *Am. J. Surg.*, 1959, 98: 677.

A STUDY of the data on all patients (269 cases) with squamous cell carcinoma of the anterior part of the tongue treated in any manner at the Mayo Clinic in the years 1945 to 1954 inclusive disclosed little

difference in survival among the various treatment groups when the extent of the local and the metastatic lesions was considered. Such difference as was observed appeared to favor wide local excision or hemiglossectomy, plus removal of the homolateral cervical lymphatics as either a composite or a separate procedure. The 5 year survival rate for the entire series was 46.2 per cent.

Hemangioma of the Jaws. HOWARD W. SMITH. *Arch. Otolar.*, Chic., 1959, 70: 579.

HEMANGIOMAS OF THE JAWS are fortunately rare. Often the first indication of the diagnosis was a profuse exsanguinating hemorrhage after a tooth was extracted. Mucosal bleeding, swelling, pain, throbbing, and a sense of pressure were the most common symptoms and findings, usually in children or young adults. The gingival bleeding was peculiar in that it was spurting in character, rather than the usual indolent gingival variety.

The roentgen findings are the most helpful in obtaining a working clinical diagnosis. The picture is one of multicystic areas of bone resorption, producing a soap-bubble or honeycomb effect.

Angiomas of bone are of two types: those arising from blood vessels within the bone and affecting bone primarily, and those arising from blood vessels of the periosteum and affecting bone secondarily. These blood vessel tumors have an embryonic capacity for irregular and unrestrained growth.

A case is reported in which the typical fearsome hemorrhage occurred and was controlled with difficulty by gelfoam packing. A biopsy was obtained and later radiation therapy effected an excellent result. —*Ernest D. Bloomenthal, M.D.*

The Surgery of Facial Clefts (Kritischer Beitrag zum Stand der Spaltchirurgie). D. SCHLEGEL. *Zbl. Chir.*, Leipzig, 1959, 84: 1489.

THE AUTHOR, of the Department of Oral Surgery of the University of Kiel, Germany, reviews various theories on the genesis of facial clefts and discusses the different methods of their surgical repair. He reports and tabulates a series of 201 cases of his own experience.

Basing his study on a large number of statistics from many countries, the author states that the incidence of facial clefts has been increasing considerably in Europe and predicts that this trend is going to continue in the future because of increasing radioactive contamination of the atmosphere. The incidence in the Obstetrical Department of the University of Kiel was 25 cases or 0.14 per cent in 17,698 births during the decade from 1937 to 1947. The malformation is about twice as frequent in males as in females.

The pathogenesis is discussed briefly. The older theory that the face is developed in the embryo from three processes, one frontal and two maxillary, and that facial clefts are caused by nonunion of these processes has been abandoned. The consensus is now that the clefts result from secondary fissures in the embryonal face. These fissures originate during the first 3 months of embryonal life.

The cause of facial clefts is unknown. Heredity, intrauterine anoxia, avitaminosis, virus infections such as rubella, and disturbances of the hormonal equilibrium have been suggested as causative factors.

The timing and techniques of the repair are discussed in detail. The age at which the intervention is carried out plays a decisive role. The more severe a cleft the earlier it should be operated on, provided that the general condition of the patient permits the intervention. The earlier a cleft palate—especially if it is bilateral—is repaired the better is the effect on speech development. On the other hand, an early repair makes longer postoperative orthodontic therapy necessary. The cleft lip should be repaired as early as possible, at 1 to 3 months of age. Several reasons militate against lip repair at a later date, during the second or third year. If not repaired early the gap tends to get wider and is more difficult to bridge, and the danger of middle ear infections increases.

Closing of the cleft palate should be done after the deciduous teeth are cut, that is, at the age of 4 to 5 years. If for psychologic or other reasons an earlier closing of the cleft palate is preferred, this can be performed in two stages: repair of the soft palate at the age of 4 to 6 months and of the hard palate after eruption of the second dentition. This procedure will not interfere with normal growth of the jaw, will protect the child from ear infections, and will produce better speech development.

The author emphasizes the importance of co-operation of the oral surgeon, orthodontist, and speech therapist to insure optimal results.

—*Werner M. Solmitz, M.D.*

Methods of Reconstruction Following Resection of Anterior Oral Cavity and Mandible for Malignancy. JOHN D. DESPREZ and CLIFFORD L. KIEHN. *Plastic & Reconstr. Surg.*, 1959, 24: 238.

THE GREATEST CAUSE of failure to cure cancer of the oral cavity is failure to eradicate the primary lesion. The use of reconstructive procedures at the time of primary excision enhances the resectability of the primary lesion by permitting the removal of more local tissue without the development of a surgical cripple. Lesions located anterior to the mental foramen should be considered to have bilateral lymphatic drainage, and adequate resection implies the use of a bilateral approach. For these anterior lesions, the authors perform a continuity en bloc resection of the primary lesion and a complete neck dissection on the predominant side together with, by choice, a supraomohyoid dissection, or at least a suprahyoid dissection on the contralateral side.

The principle of restoring normal tissue to its normal position is faithfully carried out. When essentially only half of the anterior tongue is sacrificed a satisfactory result is obtained by turning the intact half on itself, thus shortening the tongue but utilizing the remaining normal tissue. The authors have employed the skin graft to mobilize the anterior tongue and have found a two-stage technique satisfactory. A tunnel is made through the adherent portion of the side of the tongue and the graft on a stent is inserted to line the tunnel circumferentially. After 10 days the intact roof of the tunnel is incised under local anesthesia, the stent is removed, and the skin lined sulcus is exposed. Restoration of lining tissue is imperative.

Only in optimal cases is local tissue sufficient. The free skin graft, in the authors' opinion, has unlimited usefulness. Their method of choice is the direct apron flap modified essentially to an island flap and performed as a one-stage procedure. A skeletal scaffold is provided by a Kirschner wire or bone graft. The retention of a cortical rim for mandibular continuity has not been uncomplicated. Success with proper immediate bone grafts has been rewarding. The "shishkebab" technique is particularly applicable to the anterior mandible. In supporting the hyoid bone a suspension wire, fascia lata, or dermal strip is used.

The authors conclude that the most satisfactory curative functional and cosmetic result has been obtained by the employment of the apron flap, immediate bone graft, and dermal strip, and that the postoperative morbidity in these patients has been lessened considerably. —*Frank W. Pirruccello, M.D.*

PHARYNX

Carcinoma of the Tonsillar Area and Factors Influencing the Results of Treatment. Norah DuV. Tapley, Robert A. Evans, Morton M. Kligerman, and Harold W. Jacox. *Am. J. Roentg.*, 1959, 82: 626.

An analysis of patients with carcinoma of the tonsillar area who were seen at the Columbia-Presbyterian Medical Center in New York City is presented. The presenting symptoms and the extent of the disease, the histology of the lesion, the age, and the economic status of the patient are discussed. The authors found that none of these criteria were of value in predicting the outcome. Also they found no evidence that the form of the radiation therapy of the primary lesion had an important effect on the outcome.

The 5 year survival rate was 32 per cent and women had a better prognosis than men.

—*John J. Ballenger, M.D.*

Improved Outlook for Patients with Carcinoma of the Pharynx. Will P. Pirkey. *Rocky Mountain M. J.*, 1959, 56: 65.

One stage radical resection of the larynx, pharynx, and neck with immediate reconstruction has improved the prognosis of laryngopharyngeal or hypopharyngeal cancer. Early surgical methods of treating this condition were discouraging. The radiation treatment has also been unsatisfactory, but the surgical technique of primary reconstruction of the pharynx and cervical esophagus with a free split thickness abdominal skin graft has solved the major surgical problem—that of reconstruction. The graft is fashioned into a tubular form about a tubular stent of nylon, dacron, or teflon, and then sutured into position. In this way the operative wound is kept free from saliva, thus discouraging infection. The stent, which is left in place for at least 5 or 6 months, discourages stenosis.

The author briefly mentions 7 such patients operated upon 6 or 7 years ago. One patient died of gastric ulcer and 1 died of metastatic disease. The remaining 5 are alive and well after at least 5 years and have developed excellent pharyngeal speech. This type of reconstruction is indicated if 70 per cent or more of the pharyngeal circumference has been excised. It may also be used when other methods of reconstruction have been tried but have failed.

—*John R. Lindsay, M.D.*

NECK

✓ **Bilateral Radical Neck Dissection.** Charles J. Staley and Edward F. Scanlon. *Am. J. Surg.*, 1959, 98: 851.

The concept that bilateral metastasis constitutes a contraindication to surgical intervention is no longer tenable in surgery of the head or neck. The authors concern themselves in this article with bilateral radical neck dissection and excision of both internal jugular veins as a one or two stage procedure. Emphasis is placed on the one stage operation.

Crile, in 1906, recorded a staged bilateral radical neck dissection, and the first one stage bilateral neck dissection was performed by Moore and Smith in 1951. This operation implies bilateral sacrifice of the anterior, external, and internal jugular veins. The vertebral plexus is thought to be the major area of collateral circulation after this operation.

When bilateral metastases are present initially, the authors recommend a one stage bilateral radical neck dissection. When metastases develop on the opposite side after a unilateral neck dissection, the operation is performed in separate stages. It is not necessary to preserve the internal jugular vein on the second side. The facial congestion in the two stage procedure is certainly no less than that seen in the one stage procedure and may actually be more severe.

Martin has reported on 66 bilateral neck dissections, and the present authors report on 9 such operations: 4 one stage and 5 two stage procedures. The one stage dissections have been carried out with two surgical teams operating simultaneously. Tracheostomy is performed regularly. Postoperatively, the head of the patient's bed is elevated 30 degrees or more. The authors do not consider that subarachnoid decompression is necessary. During the final stages or immediately after this operation the patient's face may be moderately to markedly congested. A considerable degree of facial edema will develop in the majority of patients. After a time this subsides, but slight edema of the lower portion of the face may persist indefinitely. —*Alan Thal, M.D.*

Traumatic Thrombosis of the Internal Carotid Artery. T. D. R. Hockaday. *J. Neur. Neurosurg. Psychiat.*, Lond., 1959, 22: 229.

Thrombosis of the internal carotid artery after trauma without laceration of the neck is extremely rare, but has been reported somewhat more frequently in the past decade. Two additional cases are reported and 4 cases in the literature are reviewed. The diagnosis was confirmed by an arteriogram in all cases.

The initial injury in these cases is usually not severe and the neck may show only minor abrasions or contusions. Hemiplegia and unconsciousness usually develop slowly during the first 6 hours and in one instance appeared 30 hours after injury. It is probable that the delayed onset is due to propagation of the clot from its point of origin, usually 2 cm. above the bifur-

cation of the carotid, distally to break the continuity of the circle of Willis.

The author does not suggest any specific therapeutic measures. He was unable to correlate the clinical findings in patients who survived with those in patients who died. —*Richard E. Gardner, M.D.*

Syndromes of the Head and Neck of Dental Origin, Pain Caused by Mandibular Dysfunction. HAROLD GELB and GODFREY E. ARNOLD. *Arch. Otolar.*, Chic., 1959, 70: 681.

DISEASES AND DISTURBANCES of the temporomandibular articulation present one of the most controversial problems in medical and dental science.

Costen's syndrome of ear symptoms, regional pain, trismus, and other miscellaneous symptoms of the mouth, ear, and buccal mucosa is discussed. Costen claimed that all of these symptoms were caused by temporomandibular joint dysfunction. The authors maintain that no single factor can be responsible for all of these symptoms, and initiated a study of them.

The problem was approached from the viewpoint of three symptoms: (1) pain; (2) tinnitus, and (3) hearing loss. In this article they report the results of their study of the first symptom; tinnitus and hearing loss are to be subjects of subsequent investigations.

Abnormalities of the masticating mechanism with which pain is associated are discussed in detail. These include trauma, diseases of the surrounding tissues, and muscle spasm. The anatomy and physiology of the muscles of mastication are also discussed. The authors support the view that small "trigger areas" in the myofascial structures are hypersensitive to stretch and give rise to muscle spasm and referred pain.

One hundred cases are reported. The ears, nose, and throat were always searched for possible local or systemic diseases, and thorough dental examination followed. Treatment included the correction of occlusal defects by the use of temporary acrylic splints, and relief of muscle spasm by spraying trigger areas with ethyl chloride and by injecting local anesthetics.

Seventy per cent of the patients complained of pain. Five typical case reports are presented in which the outlined treatment resulted in rapid remission of symptoms. The authors claim a high percentage of similarly successful cases. —*John R. Lindsay, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Carotid Angiography in Cerebral Vascular Disease (Die Karotisangiographie beim zerebralen Insult). A. RUPPRECHT and E. SCHERZER. *Wien. med. Wschr.*, 1959, 109: 692.

THE ANGIOGRAPHIC FINDINGS in 1,012 patients with a clinical diagnosis of apoplexy are reported. This study covers the period between 1952 and 1958.

Of the 1,012 cases, there were angiographic changes suggestive of arteriosclerosis in 548 or 54.2 per cent. The angiograms gave no evidence of disease in 203 cases, or 20.1 per cent. In 74 of the cases, complete occlusion was demonstrated. The carotid was involved in 43, the anterior cerebral artery in 5, and the middle cerebral artery in 26. Marked stenosis of the vessel was demonstrated in 128 cases of which the carotid was involved in 89, the anterior cerebral artery in 7, and the middle cerebral artery in 32.

Cerebral hemorrhage was present in 148 patients. The angiogram gave no evidence of disease in 30 cases. In 79 cases, there was either widening of the anterior loop of the cerebral artery or straightening of the carotid siphon. The anterior cerebral artery was displaced across the midline in 27 cases. In 12 patients, various pathologic processes were demonstrated, including tumors, hemangiomas, and aneurysms.

The authors conclude that carotid angiography is valuable in the evaluation of patients with cerebral vascular disease. They advocate its use in youthful or middle-aged patients, in cases in which the clinical picture is atypical or the symptoms are progressive, and in patients who have had more than one attack.

—*Sanford Larson, M.D.*

Carotid-Basilar Artery Anastomoses (Abnorme Kommunikationen zwischen dem Versorgungsgebiet der Arteria carotis interna und der Arteria basilaris, Karotido-basilaere Anastomosen). O. WIEDENMANN and E. HIPP. *Fortsch. Roentgenstrahl.*, 1959, 91:350.

THE DEVELOPMENTAL ANATOMY of the primitive trigeminal, acoustic, and hypoglossal arteries is discussed. The literature is reviewed.

The authors observed 9 carotid-basilar artery anastomoses in 7,382 carotid angiograms. Six of these were primitive trigeminal arteries, two were primitive hypoglossal arteries, and there was one primitive acoustic artery.

The demonstration of these vessels is difficult because of the adjacent bony structures. The half-axial view is recommended for the primitive hypoglossal artery, and the axial projection for the primitive trigeminal artery.

The significance of these vessels is discussed. Some authors have observed the primitive trigeminal artery in cases of subarachnoid and intracerebral bleeding, in which no other cause was demonstrable, and have suspected it as the site of hemorrhage. Others have suggested that this vessel might be involved in the development of cavernous sinus arteriovenous fistulas and also might complicate trigeminal neurotomy.

In the authors' cases the carotid-basilar artery anastomoses were without clinical significance.

Nine cases are reported and reproductions of the angiograms are included. —*Sanford Larson, M.D.*

Multiple Intracranial Aneurysms. JAMES L. POPPEN and CHARLES A. FAGER. *J. Neurosurg.*, 1959, 16: 581.

RECURRENT BLEEDING has been a most disturbing cause of subsequent death in large numbers of patients who have had surgical treatment for intracranial aneurysm. The frequency of multiple aneurysms as reported in various series is documented. Wilson, Riggs, and Rupp pointed out the association of anomalies of the circle of Willis with aneurysmal defects in a high percentage of their cases. The authors present their statistics including a description of the type of arteriography performed, the number of multiple aneurysms found, and their location. The type of operative approach is also tabulated as are the results after simple ligation of the carotid and after craniotomy.

Of 27 patients with known multiple aneurysms 11 survived. Four of the 16 deaths were the result of aneurysmal bleeding. Two patients had mycotic aneurysms. Treatment should be preceded by complete bilateral arteriograms in all cases. If any surgical procedure is feasible or can be tolerated, it should be considered for the obliteration of the second aneurysm. This is particularly true if the lesions are bilateral or if there is contralateral filling of an anterior communicating lesion. The authors believe the risks of controlled carotid ligation and limited intracranial procedures for unruptured aneurysms are small when the high mortality due to recurrent hemorrhage is considered. —*Edward B. Schlesinger, M.D.*

Ruptured Posterior Fossa Aneurysms and Their Surgical Treatment. HELEN DIMSDALE and VALENTINE LOGUE. *J. Neur. Neurosurg. Psychiat.*, Lond., 1959, 22: 202.

THE INCIDENCE of aneurysms in the posterior fossa is about 10 per cent of the intracranial aneurysms. An historical review of the experience of others is presented. There has been a pessimistic attitude toward the surgical treatment of lesions of this nature, but theoretical considerations suggest that these aneurysms are treatable.

Twelve cases were studied. Six of these were consecutive cases of patients with ruptured posterior fossa aneurysms who were operated upon successfully. One aneurysm was on the superior cerebellar artery, 3 on the posterior inferior cerebellar artery, 1 on the anterior inferior cerebellar artery, 3 on the basilar artery, 1 on the vertebral basilar junction, and 3 on the vertebral artery.

The findings of lumbar puncture, electroencephalography, and angiography are reviewed. Carotid angiography was of no value in visualizing these

aneurysms. If the result of unilateral vertebral angiography was negative, the opposite vertebral artery was injected, otherwise it was found that an aneurysm on the vertebral artery might be missed.

The principles of surgical treatment of aneurysm in this location are similar to those which apply to supratentorial aneurysms. In 2 patients when the vertebral artery was clipped the aneurysmal sac was seen to decrease in size and the amplitude of its pulsation diminish. In both patients ischemic brain stem symptoms developed after this procedure. The practical danger of vertebral artery occlusion proximal to the ruptured aneurysm lies in the production of excessive fall in blood pressure and subsequent ischemia of the brain stem. The sitting position was utilized. Aneurysms on the vertebral arteries and their branches were explored through a unilateral posterior fossa craniectomy; aneurysms on the basilar and superior cerebellar arteries were visualized by a transtentorial approach through the posterior temporo-occipital region. Homonymous hemianopsia invariably resulted from this exposure but cleared in 1 to 3 weeks. Arteriography and operation were performed as soon after the hemorrhage as the patient's condition permitted.

Early diagnosis is important since these aneurysms rupture repeatedly. A good condition of the patient at the time of the operation and an absence of significant paresis of the cranial nerve or other paresis are features which assist in obtaining a satisfactory operative result. Unless signs from the adjacent cranial nerve indicate without doubt that the lesion is in the posterior fossa, the difference in incidence between anterior cerebral-anterior communicating aneurysms on the one hand and basilar-vertebral aneurysms on the other suggests that it would seem essential to carry out bilateral carotid angiography as an initial investigation. Delay, however, before proceeding to vertebral angiography should be minimal since fatal bleeding might occur at any time in the posterior fossa or irrevocable damage to vision result if subhyaloid hemorrhages are prominent. Vertebral angiography should be bilateral. If the lesion proves operable the results are good in experienced hands even if the patients are gravely ill from recurrent hemorrhages at the time of surgical intervention. Hydrocephalus may occur as a complication of hemorrhage. —*W. Eugene Stern, M.D.*

The Coronal Scalp Incision for Access to the Frontobasal Regions (Erweiterte Anzeigen fuer den Visierlappenschnitt bei Eingriffen am Frontobasal-Schaedel). HARRY MENNIG. *Langenbecks Arch. klin. Chir.*, 1959, 21: 310.

THE AUTHOR advocates the use of the coronal scalp incision with reflection of the scalp flap anteriorly as the best approach to the frontal area of the cranium. This approach provides good exposure of the temporal, frontal, and basal regions of the skull, as well as the frontal sinuses and the frontal and temporal lobes of the brain. The cosmetic results are good. He has used this incision in treating compound depressed fractures of the frontal bone, osteomyelitis of the frontal bone, various diseases of the frontal sinus, craniosinus fistula, and persistent traumatic pneumocephalus.

The previous surgical approaches to this region are discussed. The author concludes that these are unsatisfactory because of the poor exposure provided and because of the poor cosmetic results obtained. He reports several cases demonstrating the advantages of his method. —*Sanford Larson, M.D.*

Spontaneous Subarachnoid Hemorrhage Simulating Acute Myocardial Infarction. E. F. BEARD, J. W. ROBERTSON, and R. C. L. ROBERTSON. *Am. Heart J.*, 1959, 58: 755.

THE AUTHORS report a case in which the absence of the usual clinical signs and symptoms of subarachnoid bleeding and the presence of chest pain and of ST segment and T wave changes in the electrocardiogram suggesting myocardial ischemia and injury led to an erroneous diagnosis of an acute myocardial infarction in a patient with spontaneous subarachnoid hemorrhage and no heart disease. A brief review of previous experience reported by others with lesions in the central nervous system which produce transient electrocardiographic changes is given. Particularly notable are the electrocardiographic changes in association with cerebrovascular accidents. These are primarily T wave alterations.

A case report including representative tracings of the electrocardiograms is presented. The T waves were deeply inverted; the ST segments showed elevation and "coving" suggestive of subepicardial injury. The patient had had two previous episodes of fainting. Her present complaint was characterized by chest and back pain; there were no neurologic abnormalities and the patient was discharged. She returned after a generalized seizure, which produced severe headache, nuchal guarding, and grossly bloody spinal fluid. Angiographic study revealed a multilobulated aneurysm arising on the internal carotid artery on the right side. The patient died on the third day after operation for this aneurysm. At autopsy the coronary arteries were entirely normal; there was no evidence of myocardial infarction on gross or microscopic examination. The present study provides no information as to the causation of the changes noted in the electrocardiographic tracing.

—*W. Eugene Stern, M.D.*

Surgical Treatment of Recurring Adhesive Arachnoiditis of the Cisterna Cerebellomedullaris (Tratamiento quirúrgico de las aracnoiditis fibroadhesivas cerebelomedulares recidivantes). JUAN B. ALBERTENGO. *An. cirug.*, Rosario, 1959, 24: 1.

THE AUTHOR is concerned with the use of shunting operations around cisternal areas in which blocking of the circulation of cerebrospinal fluid has resulted from adhesive arachnoiditis of assorted causes.

He reports 2 cases of this condition in the posterior fossa in which a ventriculocisternotomy was combined with a supplemental shunt between the cisterna magna and a mid or lower cervical subarachnoid space, and 1 in which a shunt between the lateral ventricle and the subarachnoid space at the level of the fourth cervical vertebra was established. A fourth case is described in which adhesive arachnoiditis at a low thoracic level followed resection of a very large extramedullary tumor. The ensuing block

was bypassed by two lengths of polyethylene tubing, perforated at 1 cm. intervals and placed lengthwise within the theca, the ends being above and below the level of the diseased segment. In the supplemental shunt between the cisterna magna and the subarachnoid space at the level of the seventh cervical vertebra, the tube was carried extraspinally over the laminas and its lower end inserted into the space by means of a hemilaminectomy and an opening in the dura. —*Juan E. Fonseca, M.D.*

The Diagnosis and Treatment of Hydrocephalus in Children (Zweckmaessige Verfahren fuer die Diagnose und Therapie des Hydrocephalus in Kindesalter). W. UMBACH. *Neurochirurgia*, Stuttg., 1959, 2: 1.

THE CAUSE and pathogenesis of hydrocephalus in children are considered. Excessive production of cerebrospinal fluid, obstruction of its flow, or insufficient absorption are the most important factors. The cerebrospinal fluid is largely produced by the choroid plexuses of the ventricles, and absorption takes place over the surface of the hemispheres.

The physical and roentgen findings are discussed. The air study is the most valuable diagnostic procedure. Dye tests are useful when making the diagnosis of obstruction and also provide some information concerning fluid production and absorption. The author does not think radioactive isotopes are of much diagnostic value in these cases.

The treatment depends upon the cause, but is almost without exception surgical. Nonsurgical measures such as hypertonic sucrose, salt-free diet, diuretics, carbonic anhydrase inhibitors, and the purgatives have only a temporary usefulness.

Resection of the choroid plexus is recommended in cases of excessive secretion of cerebrospinal fluid. In noncommunicating hydrocephalus, the obstruction should be removed whenever possible or, if this is not feasible, a bypass operation such as the Torkildsen procedure is recommended. In communicating hydrocephalus, the cerebrospinal fluid may be shunted to other structures to provide drainage by means of ventriculomastoid, ventriculoureteral, ventriculoperitoneal, or ventriulojugular shunts. The advantages and disadvantages of these various procedures are discussed. —*Sanford Larson, M.D.*

Discussion on the Management of Prolonged Unconsciousness. E. A. PASK, HUGH GARLAND, and WALPOLE LEWIN. *Proc. R. Soc. M.*, Lond., 1959, 52: 875.

INSUFFICIENT RESPIRATORY EXCHANGE may contribute to coma or result from the causes of coma. It is difficult to assess whether the functional defects are severe enough to menace life or are significant as the cause of unconsciousness. The measurement of ventilation by a book form spirometer made of polyvinal plastic sheeting is recommended and for bedside analysis the patient rebreathes a liter of oxygen into a polythene bag. Some of the gas is expelled through a bubbling device into an indicator solution. It is possible to ascertain thereby the carbon dioxide tension in the mixed venous blood. Arterial oxygen saturation is analyzed by one of the Kramer photometric techniques. The use of mechanical ventilators may assess the need for a tracheostomy and contribute to ascertaining how much defective breathing contributes to the persistence or aggravation, if not the cause, of the coma. Temporary artificial respiratory aid can contribute to remission of the impaired consciousness.

An outline of a program for the therapy of tetanus of the severe type at the general infirmary at Leeds, England was presented by Garland. In the past 4 years 23 patients with tetanus have been treated. Initially, antitetanic serum is given on admission. When drugs no longer control the severe tetanic spasms, paralysis is induced with drugs of the curare type. This must be preceded by tracheostomy and followed by continuous positive pressure respiration. Sedation is administered to depress consciousness. Because of pharyngeal ulceration from the use of intranasal rubber tubes, gastrostomy has been instituted. Chlorpromazine helps in the control of vomiting, but intestinal ileus, urinary retention, and edema, particularly about the face and sacrum, have been common. Of the 23 patients treated, 7 have died. Most of the deaths resulted from some complication of therapy. Active immunization should be started upon discharge from hospital.

The management of prolonged unconsciousness after head injury as experienced from the treatment of 102 patients unconscious after head injury for more than 1 month at the Radcliffe Infirmary at Oxford, England was summarized by Lewin. He discussed the management of shock, temperature elevation, hydration, and caloric requirements.

Special methods of treatment were analyzed, including the use of hypothermia which, in this clinic, has been used for 39 patients in coma. Hypothermia offered little to patients with cerebral compression from intracranial clot or from severe contusion or laceration. It may have a place in the treatment of a patient who remains unconscious with decerebration, hyperpnea, and pyrexia from a diffuse cerebral injury. Hypertonic fluids and pharmaceuticals were utilized. Chlorpromazine has been useful to relieve muscle spasm and diminish tonic fits. Complications include metabolic disorders, renal failure, changes in weight, gastrointestinal ulceration and hemorrhage, spasticity, contractures, calcification, and ossification in the soft tissues. The nursing care of the patient in the prone position is emphasized. Of the 102 patients who remained unconscious for periods of 1 to 16 months, 63 survived. Nineteen recovered sufficiently to return to their former work. An additional 29 patients made sufficient practical recovery to return to their jobs or work in their homes. If a good recovery is to be made some improvement is to be expected within 1 month of injury; there should be more responses to pain and diminished spasticity.

No patient who has had a gross and progressive ventricular dilatation as the weeks have gone by has recovered. —*W. Eugene Stern, M.D.*

Pituitary Tumors Manifested After Adrenalectomy for Cushing's Syndrome. D. A. D. MONTGOMERY, R. B. WELBOURN, W. T. E. MCCAUGHEY, and C. A. GLEADHILL. *Lancet*, Lond., 1959, 2: 707.

THE AUTHORS review the experience of beneficial results from adrenalectomy for Cushing's syndrome. Adenomas, two-thirds of which are basophilic, are

present in half the patients with Cushing's syndrome; a few patients may demonstrate enlargement of the sella turcica. The authors believe that pituitary tumors continued to grow and ultimately caused trouble in those whose lives were prolonged by adrenalectomy. The history of such a possible sequence of events is reviewed.

They report 2 cases, the first being that of a 15 year old girl with Cushing's syndrome for which subtotal adrenalectomy was carried out; the operation was followed by signs and symptoms of intracranial disease and subsequent death. Autopsy examination demonstrated a hemorrhagic tumor of 4 by 3 by 3 cm. which proved to be a transitional basophilic carcinoma.

The second case was that of a 34 year old woman who underwent subtotal adrenalectomy for Cushing's disease. Six months after operation generalized pigmentation of the skin was noted, as it had been in the first case. Two and one-half years after adrenalectomy enlargement of the sella turcica was noted. Hypophysectomy was carried out. The optic nerves and chiasm were found to be elevated over a cystic pituitary tumor which proved to be a transitional basophilic adenoma.

The striking pigmentation which occurred post-adrenalectomy was probably caused by a melanocyte-stimulating hormone secreted by the tumor. There were no other clinical or laboratory features of adrenal insufficiency, and the pituitary tumor contained a large amount of corticotrophin. The authors consider it wise to take roentgenograms of the pituitary fossa at regular intervals after adrenalectomy for Cushing's disease and to regard seriously widespread pigmentation which does not fade rapidly under treatment with cortisone.

—*W. Eugene Stern, M.D.*

A Look Ahead at Technical and Training Developments in Neurosurgery. J. Lawrence Pool. *Bull. N. York Acad. M.*, 1959, 35: 734.

The author reviews the recent trends of neurosurgical interest as shown by the number of publications on major topics each year from 1944 to 1959 in the Journal of Neurosurgery. Immediately after World War II, there was a marked interest in clinical and experimental studies of brain, spine, and nerve injuries.

The treatment of brain tumors has received a steady share of attention through the years, although interest in this direction appears to have waned recently. However, the advent of new diagnostic procedures leads us to believe that better results in the management of brain tumors can be expected in the future. Specific drug therapy and roentgen treatment of glioblastoma may further increase the interest in this type of tumor.

The treatment of various types of hydrocephalus has always been of great interest to neurosurgeons and will probably continue to receive their attention in view of the many unsolved problems. The multiplicity of past and current therapeutic measures points up the need for further investigation. Although the surgery of intervertebral discs comprises a goodly amount of the neurosurgeon's work it has received proportionately less attention than some other types of neurologic surgery. There has been a steady increase in the number of articles on vascular surgery and a steady increase in the use of radioactive techniques for the study of the cerebrospinal fluid and the blood-brain barrier. There has been increased interest in the use of stereotaxic procedures for the human brain as well as in the use of new forms of electronic devices.

This information is to be used to predict future trends in neurosurgery and thereby to try to prepare a rational course of training for the neurologic surgeon of tomorrow. Certain changes should be made. Training must always be centered on the basic diagnostic, surgical, and physiologic principles, and increasing attention must be devoted to such matters as the application to neurosurgery of radioactive ultrasonic, electronic, biochemical, and stereotaxic techniques.

The author has also made a survey of 30 neurosurgeons, half of whom were trained at the Neurologic Institute in New York. It would seem that the surgeon from the larger urban clinic spent relatively more time taking care of patients with brain tumor than did the surgeon from a smaller clinic or from a smaller practice. However, the latter spent a greater percentage of his time dealing with the problems of the intervertebral disc and with trauma. It would seem that the neurosurgeon headed for a nonacademic independent career would be particularly concerned with the management of disc and trauma problems which together may comprise more than two-thirds of his practice. A neurosurgeon headed for the larger clinic should not only be especially well-trained in the management of brain tumor and aneurysm, but also in some of the more highly specialized types of neurologic surgery such as the use of stereotaxic apparatus, the pain-relieving, pituitary operations, and other procedures which are often dependent on special equipment and close teamwork with other specialists. The author states that the majority of the surgeons he consulted think that the neurologic surgeon should have 2 years of general surgical experience and at least 1 year of neurologic training. Some instruction in the medicolegal aspects of medicine should also be included. The trainee should also be especially trained in interpreting roentgenograms, since he may have to rely entirely upon his own diagnostic acumen.

—*Nicholas Wetzel, M.D.*

SPINAL CORD AND ITS COVERINGS

Compressions of the Cervical Spinal Cord by Protrusions of the Intervertebral Disc (Les compressions de la moelle cervicale par protrusion discale). J.-E. Paillas, G. Piganiol, and R. Sedan. *Ann. Chir.*, Par., 1959, 13: 1019.

The authors review a series of 35 patients who suffered cervical spinal cord compression from massive protrusions of the intervertebral disc. They do not include in their series any patients who suffered only radicular pain from cervical osteoarthritis or slight discal herniation. They found this disease to occur most often in the middle age of life, particularly between 50 and 60 years. Only 1 of their patients was less than 30 years old. Twenty-six of the patients were

men and 9 were women. Injury seemed to be a factor in 11 of the cases. Thirteen of the herniations occurred between the fifth and the sixth cervical vertebrae, 10 between the sixth and seventh, 4 between the fourth and fifth, 3 between the seventh cervical and first dorsal, and 1 between the third and fourth vertebrae. In 4 patients, the process involved from 2 to 4 interspaces at the same time. In 15 of the patients, the nuclear fragment was soft, but in 9 it was strongly calcified. In 11 cases a marked osteophyte spurring was noted which was impossible to remove. The authors believe that the symptoms produced are due not only to the direct compression of the cord but also to the indirect action of the mass on the blood vessel of the cord, particularly on the anterior spinal artery. The onset of the condition in their experience can be acute, aggravated by an injury, and this occurred in 3 patients. In 12 patients the evolution of the disease occurred in less than 2 years. In 6 subjects the evolution lasted 5 years, and the maximum evolution of the disease was one of about 20 years.

So far as the symptomatology of the disease is concerned, 29 patients had dysesthesia. Many others had pain in their upper arms, and 2 patients had pain particularly referred to the scapular region. Subjective sensory disturbances were noted in 22 patients. Motor disturbances were noted unilaterally in 13 patients and bilaterally in 4 patients. Muscular atrophy was frequently noted in 6 patients, and contractures of the small muscles of the hand were noted. Insofar as the lower extremities are concerned, 25 patients had difficulty in walking. Two patients were paraplegic. In almost all of the patients increase in the deep tendon reflexes in the lower extremities and pathologic toe signs were noted. In 23 cases these motor disturbances were bilateral. Sensory disturbances were less frequent and less intense in the lower extremities as compared to the upper extremities. Pupillary disturbances were noted in 9 patients. Seventeen patients had difficulty with urination. Radiologic changes in the spine were noted in 30 out of 32 cases with plain roentgenograms.

The authors thought that studies with lipiodol were very precise but sometimes very difficult. The authors do not believe that medical therapy has a place in the treatment of this condition. They believe that the only operative approach possible is a laminectomy. The peridural space anteriorly can be partially explored by the extradural approach, but the dura mater itself should almost always be opened and the herniation removed by this transdural approach. Section of the dentate ligament should be carried out in all cases since it permits relative displacement of the cord without difficulty. In 24 patients the disc herniation was removed, but in 11 patients it was not possible to remove the herniation and in these the laminectomy was enlarged.

They found notable changes in the cord in 6 patients. Some of the earlier patients were operated upon in the prone position, but more recently the authors have employed the sitting position, recognizing the danger of air embolism.

The authors thought that the operative results were generally good and 3 months after the operation 17 of their patients had been markedly benefited. So far as the late results are concerned, in the 25 patients they were able to study there were 9 complete cures. Five patients were considerably benefited.

—*Nicholas Wetzel, M.D.*

The Use of Rotation Flaps Following Excision of Lumbar Myelomeningoceles, an Aid to the Closure of Large Defects. T. J. S. PATERSON and K. TILL. *Brit. J. Surg.*, 1959, 46: 606.

THE AUTHORS dismiss the question of the advisability of surgical treatment of myelomeningoceles and confine themselves to the technical problem of closure of the defect after excision of the lesion in such a fashion as to afford a covering of healthy skin and subcutaneous tissue. In many cases the defect is too large to allow simple closure of the skin edges and rotation flaps from adjacent areas of the back and buttocks are needed. The authors stress the importance of preoperative assessment of the factors involved in adequate closure.

The authors report their experience with myelomeningoceles for 6 years at the Hospital for Sick Children in London, England. There is rarely any difficulty in closing cervical and dorsal myelomeningoceles, but 25 per cent of the lumbar myelomeningoceles could not be closed by simple direct suture. The stretched skin at the margin of the excision retracts and thickens and is rarely strong enough for a permanent repair by direct suture. This marginal skin may also contain hemangiomatous malformations which make it unsuitable for suture. Once the fringes of the retracted abnormal skin have been excised, the surgeon may have an excessively large defect to cover by conventional means. When the diameter of the sac is more than half the width of the back, watertight closure will not be possible by simple approximation.

The most effective procedure is that known as the 'S rotation flap' in which the defect is considered as a triangle or multiple triangles. A circular defect resulting from excision of the meningocele can be considered as two triangles and can be closed by two flaps rotating in opposite directions. After removal of the sac all thin and discolored skin is trimmed, the flaps are marked out in ink, and each flap is planned so that the width of the base is equal to the length of the flap. The flaps as designed should be rotatable into their new position without tension. Sutures are inserted to advance the flap along the thick side to ensure that there is no tension on the center. A 'dog-ear' of excess tissue on the thick side is raised up in this fashion and is a convenient site for a drain, which is important in order to prevent burrowing or accumulation of the fluid under the flap. Postoperatively the infant is kept in prone position and the foot of the bed raised to reduce cerebrospinal fluid pressure.

This article is carefully documented with excellent photographs of the technique of rotation and suture of the flaps. —*Edward B. Schlesinger, M.D.*

The Surgical Treatment of Paraplegia Due to Tuberculous Spondylitis (Tratamiento quirúrgico de la paraplejía en la espondilitis tuberculosa). STEFANO TENEFF. *Cir. cirujan.*, Méx., 1959, 28: 303.

THE PATHOLOGIC CHANGES found in the spinal cord of patients with paraplegia resulting from tuberculous

spondylitis are described. The surgical treatment of this condition should be such that the two basic problems present—the compression of the spinal cord and the chronic infection in the bone—may be relieved at the same time. Many of the types of treatment proposed in the past, such as aspiration of a cold abscess, will not achieve this end. A standard laminectomy is not enough to cure the patient, since it may only relieve the patient's neurologic symptoms without affecting the basic disease process in the vertebral body. The author advocates a costotransversectomy combined with lateral removal of the pedicles and lateral fusion of the vertebral bodies to decompress the spine. In those patients whose spinal cord is compressed by a gibbus, a laminectomy alone is not sufficient to decompress the spinal cord adequately. The laminectomy should be combined with anterior decompression by removal of the posterior portions of the vertebral body at the site of the gibbus.

A reasonable degree of success may be achieved with the present-day use of antibiotics and improved surgical technique, and prolonged conservative treatment has no advantages. —*Nicholas Wetzel, M.D.*

Spinal Meningiomas, an Anatomic and Therapeutic Study of 57 Cases (Les méningiomes rachidiens, étude anatomo-clinique et thérapeutique d'après 57 cas). B. PERTUISET, P. OUVRY, and J. METZGER. *Ann. chir., Par.*, 1959, 13: 1073.

THE MENINGIOMA is the most common spinal cord tumor. The authors review a series of 57 such tumors that were observed in the Neurosurgical Clinic of the Pitié Hospital, Paris, France between 1929 and 1959. During the same period, 39 neuromas were found in a total series of 268 compressive spinal cord tumors. Five of the spinal meningiomas were in the cervical region, 51 in the dorsal region, and 1 in the lumbar region. The tumor was ventrolateral to the cord in 22 cases and dorsolateral in 33. In 2 cases the tumor was so extensive as to make this distinction impossible. None of the tumors was either completely dorsal or ventral to the cord. Nine of the patients were men and 48 women. Fifty-five of the patients were more than 30 years of age, and 17 were between 60 and 70 years of age.

The authors believe that these tumors cause, for a considerable period of time, only minimal symptoms. Fifty of the 57 patients noted sensory disturbances as their first symptom. In only 6 cases were motor symptoms noted before sensory symptoms. In 1 patient, the first symptom was of a sphincter disturbance. During the period when the patient has only a single symptom the diagnosis is most difficult. When a second symptom and signs of neurologic disturbance appear, the diagnosis is more easily made. The authors divide the polysymptomatic patients into four groups: in the first group, only sensory disturbances are apparent; in the second group, sensory disturbances plus motor disturbances are notable; in the third group, spastic paraplegia is noted; and in the fourth, flaccid paraplegia is noted. The diagnosis is aided by an examination of the cerebrospinal fluid which was found to be normal in only 3 of the 57 cases studied.

The authors suggest that any middle-aged woman having dorsal back pain and radicular pain should have such a study. The exact location of the tumor can best be established by myelography, and the authors prefer the use of lipiodol instilled through a cisternal puncture. They think that the myelographic pictures are quite characteristic. There were 6 deaths in the group of 54 patients operated upon, a mortality rate of 11 per cent. Twenty-nine or 53 per cent of the patients were considered to be cured. However, if the patients were operated upon before the state of paraplegia, 75 per cent could be considered cured. Five of the deaths occurred in the patients having a flaccid paraplegia, whereas only 1 occurred in the group of patients operated upon during the early stage of the disease. The removal of the base of the tumor does not seem to be important. They did not observe any recurrences even though the base of the tumor was only coagulated. —*Nicholas Wetzel, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Radical Mastectomy for Carcinoma of the Breast. Edward B. Gray, Jr., and Thomas J. Anglem. *N. England J. M.*, 1959, 261: 1310.

An attempt is made in this presentation to determine whether radical mastectomy has been harmful. A single surgeon operated upon all of the patients and a 5 year minimum follow-up was obtained.

Of 231 patients with primary lesions, 184 underwent radical mastectomy, an operability rate of 80 per cent. Of the 47 patients rejected for operation, 21 had demonstrable metastases on roentgenographic study. Miscellaneous reasons accounted for the remainder, but in general the operability criteria of Haagensen and Stout were followed.

Three of the 184 patients who underwent radical mastectomy were lost to follow-up. There was a 67 per cent absolute survival, but for the patients with clinical stage I lesions the 5 year survival was 77 per cent. The 5 year survival rate for patients with positive axillary nodes was 47 per cent, and for those with negative nodes 88 per cent. It was found that when one or two nodes were positive the 5 year survival was 78 per cent, but if more than two were positive, the rate dropped abruptly to 37 per cent.

Early diagnosis and small size of the tumor were significant favorable factors influencing survival.

There was a 14.5 per cent local recurrence rate and 2 of these patients were apparently cured by second procedures. Central and inner quadrant lesions and positive axillary nodes were important features in patients with local recurrence.

In studying those 74 patients in whom radical mastectomy failed it was found that in no case was the operation significant in shortening life. The 5 year survival was 31 per cent as compared to the figure of 18 per cent for untreated patients cited by Nathanson.

The later series of patients who were operated upon shows a 12 per cent improvement in 5 year survival when compared with the earlier series. This figure is in line with those in other reports and indicates that patients are presenting themselves earlier for diagnosis and treatment.

The data presented corroborate the view that radical mastectomy is still the treatment of choice for patients with clinically operable carcinoma of the breast. —*John J. Bergan, M.D.*

Physical Medicine in Management of Patients with Postmastectomy Lymphedema. G. Keith Stillwell. *J. Am. M. Ass.*, 1959, 171: 2285.

The program of treatment of postmastectomy lymphedema at the Mayo Clinic for the past 4 years has aimed at reducing the volume of the extremity by simple standard procedures and at endeavoring to prevent by bandaging any swelling of the extremity for a sufficient period to permit shrinkage of the subcutaneous tissues and skin to a more nearly normal size so that tissue turgor would then be maintained at this size. The treatment has been in two phases. The first is a period of treatment in the section of physical medicine and rehabilitation and the second a program of self-treatment at home.

The majority of patients treated at the Mayo Clinic have been well satisfied with the results of the program even if they have not been able ultimately to go without elastic support for more than a few hours at a time. Success with other methods of correcting the condition would appear to be met in no greater proportion of patients. Prevention is preferable to any method of correction now available, but it is not yet practicable. Several patients who have had success with the integrated program at the clinic had previously had failure with the use of elevation or massage or bandaging alone. The entire program including the regular use of the pumping action of the muscles on veins and lymphatics is more effective than the individual components alone. The author has had little or no success in reducing the edema in a small number of patients who were unable to contract the muscles of the extremity.

Comparison of the results obtained by 52 new patients together with the results obtained by the 43 whose cases were reported previously shows that the author's experience with this method of treatment has been remarkably consistent over the past 4 years. Although one cannot predict reliably what will take place in a given patient, the results to be expected in a group of patients are quite well established for this program of treatment.

The Estimation of the Proportion of Patients Cured After Treatment for Cancer of the Breast. J. L. Haybittle. *Brit. J. Radiol.*, 1959, 32: 725.

The unsatisfactory nature of the 5 year survival rate as an index of success in the treatment of cancer, which has a long natural history and a high frequency of late recurrences, is now well recognized. Its deficiencies are particularly noticeable in cancer of the breast since some 16 per cent of untreated patients may survive 5 years from the onset of symptoms, and in typical treated groups the crude 10 year survival rate is only 60 per cent of the 5 year figure. Attempts have therefore been made to fit mathematical functions to survival statistics in order to show that a fraction "c" of patients is actually cured, and also to enable this fraction to be estimated, even when the follow-up period is comparatively short. One such attempt was based on the assumption that the distribution of survival times from first treatment of patients dying from cancer is log-normal, while another assumption was that the proportion of the uncured group still surviving decreases exponentially with time after the first treatment.

The results of an investigation into the use of theoretical models for estimating the proportion, "c", of patients cured after treatment for carcinoma of the breast are presented. The difficulties of using a log-normal or an exponential model are discussed, and

it is suggested that a better method of estimating "c" is to assume that the probability of dying from cancer decreases exponentially with increasing time after treatment. The "extrapolated actuarial" model, based on this assumption, is shown to be a good fit to some known survival data obtained by a 20 year follow-up, and at the same time the computations involved in its application are relatively simple. Full details are given of the method of calculation.

—*James H. Holman, M.D.*

TRACHEA, LUNGS, AND PLEURA

Surgical Approaches to the Trachea (Les voies d'abord chirurgicales de la trachée). E. FORSTER, M. ASSOUAD, L. HOLDERBACH, and M. MOLAVY. *Poumon*, 1959, 15: 629.

THERE ARE three principal surgical approaches to the trachea: (1) cervical, (2) endothoracic, through a sternum splitting incision, and (3) by way of a right thoracotomy.

The cervical approach is through a transverse thyroidectomy type of incision with a median longitudinal extension. The thyroid is exposed, its isthmus is divided, and the two lobes are allowed to assume a lateral position. An annular resection of the trachea, removing 3 or 4 cm., is possible to accomplish through this exposure.

The second approach is through a sternum splitting incision. This can be carried superiorly into the neck. Approximately 8 cm. of the thoracic trachea are accessible through this approach.

Exposure of the trachea through a right thoracotomy approach provides more complete exposure. The authors recommend an incision between the fourth and fifth interspace. For exposure of the carina, an incision through the sixth interspace is preferable. Through this approach, the azygos vein must be divided and the pleura must be incised.

An approach to the entire trachea may be obtained by a median sternotomy and an extension into the neck with temporary division of the innominate vein. This gives exposure to an additional 1.5 to 2 cm. of trachea which could not be exposed without division of this structure. The innominate artery can be mobilized to the right after the pericardium is incised. The authors have not utilized this approach clinically but recommend it as a result of cadaver studies. It would also be possible, according to these studies, to section the innominate artery and install a temporary bypass to permit additional exposure to the trachea.

—*Frederick W. Preston, M.D.*

Tracheal Stretching and Metaplasia of the Tracheal Rings from Cartilage to Bone Following the Use of Aortic Homografts. JOEL J. PRESSMAN and MILDRED BURTZ SIMON. *Am. Surgeon*, 1959, 25: 850.

THE EXPERIMENTS reported in this article consisted of resection of segments of cervical trachea measuring 6 by 2 cm., constituting essentially all the cartilaginous rings over a 10-ring length and that segment of the circumference represented by the cartilaginous rings, in a group of dogs. A full lumen polyethylene tube was inserted as a bridge and a homologous lyophilized aortic patch was sutured over the defect.

The periods of observation extended as long as 3 years. During this time the aorta-covered window appeared much narrower and shorter than when first created because of shrinkage and contracture of the graft. The implanted aorta retained much of its identity, not only grossly, but also microscopically, for long periods of time, the elastic fibers retaining their normal appearance and pattern for as long as 3 years. The elastic tissue of the media survived as such for long periods of time, blending intimately between the adjacent tracheal rings and the perichondrium.

When the full lumen of the trachea was replaced by an equally long segment of full lumen of aorta, stretching of the adjacent trachea occurred resulting from fibrosis of the aorta and subsequent retraction. This pull stretched the trachea by widening the membranes between the tracheal rings. This stretching was such that in one area two cartilaginous rings in the intervening membranes of the stretched segment occupied the length of eight normal rings together with the membranous interspaces. The third and most striking phenomenon took place in the tracheal rings adjacent to the aortic implant. This was the occurrence of actual metaplasia from cartilage to pure bone, including the presence of osteoblasts and what appeared to be a true haversian system. The transition was a gradual one from normal cartilage through various stages of calcification to that of the formation of cancellous bone. After 3 years the transition from cartilage to bone was complete. The metaplasia occurred only when the stretching phenomenon took place and the authors suggest that it may be the result of anoxia, based upon the peculiarities of the blood supply of the tracheal rings. This lessening of the vascular supply may be a reaction to injury as seen in the cartilages of the joints of the skeleton.

From the practical standpoint, no homograft created from any other structure or any artificial implant has been found to be of equal value to the use of aorta in the repair of large tracheal defects. By rapidly blending with the surrounding structures it prevents the formation of occluding granulomas and by contraction promotes the closure of large defects of the cervical trachea.

—*Allan D. Callow, M.D.*

Resorption of Joduron B in Chronic Pneumonia, Deforming Bronchitis, and Bronchiectasis (Die Resorption von Joduron B bei chronischer Pneumonie, deformierender Bronchitis, und Bronchiektasie). O. JAHN. *Fortsch. Roentgenstrahl*, 1959, 91: 478.

AFTER BRONCHOGRAPHY, the contrast agent, in this case joduron B, is absorbed at a rate which is dependent upon the condition of the mucosa of the bronchi. This study entailed the use of planigraphy after bronchography in order to determine the length of time it took for the contrast agent to be absorbed.

In a group of 21 normal patients, the material was no longer evident after 35 minutes. This period was prolonged to 40 minutes in a group of 26 patients with neoplasms. The agent was still visible after 40 minutes in a group of 9 patients with chronic pneumonia. Eleven patients with bronchiectasis retained the dye for over 80 minutes, and 8 patients with deforming bronchitis still showed the contrast material after 55

minutes. The author concludes this brief report with pictures demonstrating roentgenograms which were typical of those that were observed.

—*J. C. Rosenberg, M.D.*

Effect of Polluted Los Angeles Air (Smog) on Lung Volume Measurements. HURLEY L. MOTLEY, REGINALD H. SMART, and CHARLES I. LEFTWICH. *J. Am. M. Ass.*, 1959, 171: 1469.

THE ILL EFFECTS of air pollution on the health of individuals are of great interest throughout the world at present. Opinions on the effects of such pollution have been largely based on aggravation of subjective symptoms. The primary purpose of this study was to obtain quantitative lung volume measurements on human subjects, particularly those with pulmonary insufficiency, while they were breathing the naturally occurring smoggy air in the Los Angeles area.

The composition of smog in Los Angeles differs from that found in other areas. There is an absence of coal smoke and there are certain geographic conditions which reduce the existing breeze in the city area. The operation of 3,000,000 automobiles in this natural bowl is a major source of smog.

Smog itself is a complex substance that is constantly changing. Chemical reactions take place among the pollutants. Hydrocarbons are oxidized in the presence of sunlight with nitrogen dioxide acting as a catalyst. Ozone is formed. Aerosols result from finely dispersed particles of liquids or solids suspended in air. Adsorption of oxidants to aerosols intensifies the irritant effects of smog.

Sixty-six volunteers were obtained for this study, 46 of whom had pulmonary emphysema. Each subject acted as his own control and every effort was made to standardize conditions so that the only variable was the atmosphere breathed during testing. Filtered air was obtained by using activated carbon filters. Subjects remained in filtered air rooms from 2 to 90 hours.

Measurements were obtained of the total vital capacity, the timed vital capacity for 3 seconds, and the maximal breathing capacity. The volume of residual air and other measurements were carefully made. The results of these studies are extensively detailed and discussed.

A significant improvement in lung volume could be measured quantitatively in subjects with emphysema after breathing filtered air for 40 hours or longer. No significant changes were observed in volunteers without emphysema who were studied similarly. The most significant improvement in lung volume measurements with breathing of filtered air was the decrease in the volume of residual air in the subjects with emphysema.

Exposure to smog of 2 or more days is probably required to obtain the maximal deleterious effects. Likewise, the data indicate that when the subject breathed filtered air for less than 40 hours, the improvement was very much less. No benefit was noted by the volunteers after breathing filtered air from 2 to 4 hours.

These studies indicate that the impairment produced by breathing smog aggravates the pulmonary insufficiency already present in patients with chronic pulmonary disease. This response may be reversed but there is a delay in the disappearance of such adverse effects.

—*John J. Bergan, M.D.*

Adverse Surgical Experience in the Treatment of Pulmonary Disease Caused by Atypical Acid-Fast Bacilli. ROBERT W. HARRISON, ARTHUR F. REIMANN, EDWIN T. LONG, WILLIAM LESTER, JR., and WILLIAM E. ADAMS. *J. Thorac. Cardiovasc. Surg.*, 1959, 38: 481.

THERE ARE MANY REPORTS in the literature describing the isolation of atypical acid-fast organisms from patients with disease simulating tuberculosis. Also there is an increasing awareness of the role which these organisms play in the production of disease.

Reporting from the Chicago area, the authors indicate that 35 per cent of patients with positive sputum cultures have atypical acid-fast bacteria in the culture. Of these, 18.4 per cent are of the photochromogenic type and 67.8 per cent are of the scotochromogenic type. It has been found that these organisms in general are resistant to conventional chemotherapy and postoperatively yield a higher complication rate.

Atypical organisms can be classified into four main types:

1. The photochromogenic type consists of smooth colonies which become golden or lemon in color when exposed to light. There is usually growth within 14 days and guinea pig studies reveal a decreased virulence.

2. Scotochromogenic bacilli produce a colony of variable shape which is orange to brick-red when grown in the dark. Growth requires 3 to 4 weeks of incubation and guinea pig studies confirm the low virulence of the organism.

3. Battey type or nonphotochromogenic strains grow a smooth, moist colony which may appear as a confluent buff-colored film that does not change when exposed to light. The cells are coccoid and produce invasion and progressive disease in guinea pigs.

4. Rapidly growing atypical strains appear in culture by the seventh day and produce a cream to buff-colored colony unaltered by light. They do not produce progressive disease in guinea pigs and show in vitro resistance to the common tuberculostatic drugs.

Pulmonary disease caused by the photochromogenic type was seen in 108 patients. Twenty-four of these had 30 surgical procedures. Seventy five per cent of the patients were males. Seven patients had far advanced disease and the remainder had moderately advanced illness.

The most striking roentgenographic finding was the presence of thin-walled cavities which were 1 to 5 cm. in diameter and were usually solitary.

Pretreatment drug studies showed significantly elevated resistance to the standard medications, especially PAS and streptomycin. Before operation standard drug dosages were used for 2 to 15 months. The roentgenographic evidence of response to treatment was not impressive.

Surgical complications were frequent. In 2 of 5 patients with subsegmental surgery major complications developed, as they did in 3 of 6 patients with segmental resection. The patients with major resections did well, as did those who had collapse therapy.

There were four failures in this latter group. Eventually 91.5 per cent of the patients with surgical therapy demonstrated a good result.

Pathologic study revealed a variety of lesions. Nearly all specimens had cavities communicating widely with the bronchi and 90 per cent had endobronchial disease. The process seemed to grow by direct extension and demonstrated the lack of virulence of the organism.

It is believed that great attention must be paid to achieving negative sputum culture status and the elimination of endobronchial disease preoperatively. Then resection should circumscribe the disease process widely. In most cases, a lobectomy would be the least procedure advocated.

The only other group of patients with atypical acid-fast bacilli who were treated surgically had the scotochromogenic type of bacilli. There were 10 cases: 1 far advanced, 4 moderately advanced, and 5 minimal. The organisms showed moderate resistance to the usual drugs.

Drugs were given in the usual manner preoperatively and little response to therapy was observed. Six resections and four thoracoplasties were performed without complications. Histopathologic examination of specimens revealed lesions resembling pulmonary tuberculosis.

These organisms demonstrate a reduced pathogenicity and there should be little difference in management from that of the usual acid-fast infections.

—*John J. Bergan, M.D.*

Chronic Pulmonary Suppuration. N. H. DeJanney and Oscar Bigman. *Dis. Chest,* 1959, 36: 602.

This report brings up to date the opinions of physicians and surgeons on chronic pulmonary suppuration. A number of case histories are presented with their accompanying roentgenograms. Some of the data are presented in graphic form.

In the past, chronic pulmonary suppuration was considered to be primarily a surgical disease; at the present time, surgery is reserved for those patients who do not respond to medical therapy. In the past, the division between acute and chronic pulmonary suppuration was said to be approximately 6 weeks. The authors now believe that it is illogical to try to separate acute from chronic suppuration on the basis of time alone.

The difference between the mortality rates of medically and surgically treated patients was studied. In a series of patients treated medically, mortality was 34.4 per cent. One group of patients treated surgically had an apparent mortality of only 2.6 per cent. The authors conclude that this group of cases was selected. In the group surgically treated chronicity of the lesion developed in fewer patients.

The authors believe that fewer lung abscesses are seen today, probably because more people are treated early with antibiotics. Many patients will be cured with this regimen, and those who subsequently require operation may be better risks. Of a group of 32 patients reported on in 1954, twenty-eight were cured by medical treatment.

The authors believe that bronchiectasis, another suppurative disease, should be treated with antibiotics before operation is considered. They believe that resection should be reserved for extensive bronchiectasis, persistent hemoptysis, or severe hemorrhage. They quote other authors who support the use of antibiotics and postural drainage.

The authors studied 36 patients with chronic pulmonary suppuration. Fourteen of this number had been treated unsuccessfully with antibiotics before they were seen by the authors. On admission the patients were given penicillin, and sputum cultures were taken to determine sensitivity of the organism to various antibiotics. The antibiotics were changed to an appropriate one, depending on sensitivity of the organism.

The authors believe in prolonged chemotherapy and have noted improvement in patients over a period of 3 months and sometimes over a 6 month period. In the group of 36 patients, 21 had complete resolution under medical treatment. The other 14 were managed surgically. The authors recommend continuing medical management as long as improvement continues.

—*Richard L. Lawton, M.D.*

Primary Lymphosarcoma of the Lung. Emmett R. Hall, Jr., and Brian Blades. *Dis. Chest,* 1959, 36: 571.

This article concerns primary lymphosarcoma of the lung. Three patients are reported in some detail with accompanying roentgenographs and photographs of pathologic specimens. Case histories are reported in tabular form as they were reported in the literature.

The authors suggest that there are nests of lymphoid tissue and that this is probably the site of the development of lymphosarcoma. The primary lesion extends along the peribronchial lymphatics to reach the mediastinal nodes. Vascular invasion is not frequently noted. Obstruction of a bronchus by tumor is a common finding. Some comments are made about the appearance of the tumor, its histologic structure, and the relative absence of mitotic figures.

Of the 30 cases in the literature, 22 were selected for excision. In this latter group, 12 pneumonectomies and 10 lobectomies were performed. There is some question as to whether irradiation should be used routinely after removal of the lymphosarcoma. The value of cancer chemotherapeutic agents as an adjunct in the treatment of patients with primary lymphosarcoma of the lung has not been evaluated.

—*Richard L. Lawton, M.D.*

Postoperative Chylothorax. Wendell M. Levi, Jr., and Edward F. Parker. *Am. Surgeon,* 1959, 25: 960.

The authors report the cases of 2 patients with postoperative chylothorax seen and treated at the Medical College of South Carolina. Their extensive review of the literature indicates a recent progressive increase in the incidence of traumatic chylothorax complicating operative procedures and an apparent fall in mortality upon the institution of surgical correction.

They choose to classify chylothorax on an etiologic basis. 1. Traumatic chylothorax may result from (a) closed trauma, as in fractures of the vertebrae or ribs; (b) open trauma, as in operations; and (c) penetrating wounds. 2. Nontraumatic chylothorax may be due to (a) an invasive or obstructing tumor; (b) vascular

disease, as in thrombosis of the left subclavian vein; and (c) other inflammatory conditions, such as tuberculosis. 3. Spontaneous or congenital chylothorax may result from a congenital abnormality of the duct system.

The diagnosis of chylothorax usually is not difficult. Typically, the symptoms develop 5 to 9 days after the injury, if such be the cause. The ordinary symptoms consist of respiratory difficulty, weakness, anorexia, and listlessness. Physical examination reveals marked apathy and tachycardia with diminished breath sounds over the fluid. The roentgenographic appearance of the chest is that of hydrothorax.

Thoracentesis obtains an odorless, milky, alkaline, sterile fluid with a specific gravity greater than 1.012. In the adult the fluid is produced at the rate of approximately 60 to 200 c.c. per hour. The total fat content varies from 0.4 gm. per cent through 4.0 gm. per cent. Fat globules are readily visible microscopically with stains such as Sudan III.

The treatment consists first of a period of nonoperative therapy. This includes repeated thoracenteses and maintenance of a normal nutritional state primarily by administration of a fat soluble vitamin supplement and a high protein diet. Occasionally serum albumin and intravenous amino acids may be necessary, but up to the present it has not proved advisable to administer chyle intravenously.

If an adequate trial of nonoperative therapy is not successful, transthoracic ligation of the thoracic duct is the procedure of choice. Eight of 22 patients with chylothorax after cardiovascular operations were treated successfully in this manner. In 1 of the 2 cases of traumatic operative chylothorax reported by the authors, surgical ligation of the duct was successful; the patient in the other case responded satisfactorily to repeated thoracenteses and nonoperative therapy.

—*Stephen W. Carveth, M.D.*

Frequency and Causes of Acute Respiratory Insufficiency After Pleuropulmonary Surgery (Fréquences et causes de l'insuffisance respiratoire aiguë dans les suites de la chirurgie pleuropulmonaire). J.-J. Galey. *Poumon*, 1959, 15: 695.

The author presents the cases of 12 patients with acute postoperative respiratory insufficiency from diverse causes. The cases consisted of: paradoxical respiration after thoracoplasty, relieved by tracheotomy and artificial respiration; an asthmatic attack after lobectomy, relieved by tracheotomy and ACTH; atelectasis after lobectomy and thoracoplasty, unsuccessfully relieved by artificial respiration; fatal insufficiency from chronic bronchitis after radical pneumonectomy for cancer; fatal cardiac arrest during total pneumonectomy; respiratory obstruction after pleuropneumonectomy, relieved by tracheotomy; 2 cases of contralateral pneumonia after pneumonectomy, in one instance successfully cured by antibiotics, tracheotomy, and cortisone and, in one instance, by artificial respiration; and 1 case of fatal contralateral pneumonia after hemithoracectomy, incorrectly diagnosed as infarct. In 2 cases of paradoxical respiration after hemithoracectomy, tracheotomy alone sufficed to relieve the respiratory insufficiency of 1 patient, but in the other case death ensued despite artificial ventilation. A final patient died of acute pulmonary edema after decortication of a traumatic hemothorax.

Most of these complications arose after pneumonectomy. The assistance of respiratory function tests has been most helpful to the author in selecting patients for operation. In the discussion of the paper most of the speakers agreed that resection of a diseased lung did not produce respiratory insufficiency provided preoperative functional tests showed adequate reserve. Unexplained auricular fibrillation and pulmonary edema between the second and fifth days after pneumonectomy have been observed.

—*John H. Wulsin, M.D.*

Prediction of Acute Respiratory Insufficiency in the Early Stages After Pleuropulmonary Surgery (Prévision de l'insuffisance respiratoire aiguë dans les suites précoces de la chirurgie pleuropulmonaire). B. Gamain. *Poumon*, 1959, 15: 709.

Preoperative evaluation of respiratory function forecasts a more accurate picture of long term postoperative function than of the immediate postoperative phase when complication such as atelectasis, pneumothorax, and pneumonia may place unusual strain on the remaining lung tissue.

Of all respiratory function values, the author relies most on the ratio of maximum expiration per second to vital capacity (VEMS/CV), a ratio better known in America as timed vital capacity. It is a measure of pulmonary elasticity and bronchial permeability.

In addition, the acetylcholine test results point out the patient in whom bronchospasm or hypersecretion is likely to develop postoperatively. The effort test explores not only ventilation but diffusion and circulation also and serves as a check on the other values. Other tests are less useful and their findings more variable in preoperative evaluation. Bronchospirometry is reserved for special cases in which routine bronchoscopy has not yielded enough information. Little stress is placed on blood gas analyses.

Patients with respiratory insufficiency fall into three classes: (1) The decompensated emphysematous patient has typical values of a VEMS/CV of less than 30 per cent and a VEMS of less than 500 ml. Patients in this group tolerate poorly any surgical procedure unless respirations are assisted. Pulmonary resection is extremely hazardous. (2) In this group, complications can be expected and may be severe. The usual values of VEMS/CV are less than 50 per cent and VEMS is less than 1 liter. If the diseased lung of the patient in this class still functions, pneumonectomy is unwise unless the vital capacity of the opposite lung exceeds 1.5 liters. (3) Patients in this category represent the chronic bronchitic without emphysema and those with reduced thoracic kinetics. Typical values are a VEMS/CV of less than 65 per cent and a VEMS of less than 2 liters. If the opposite lung shows signs of old disease, differential bronchospirometry is mandatory.

—*John H. Wulsin, M.D.*

Prevention of Postoperative Respiratory Insufficiency (Prévention de l'insuffisance respiratoire postopératoire). H. Le Brigand. *Poumon*, 1959, 15: 721.

For patients with reduced pulmonary function certain measures are available to prevent postoperative

insufficiency, namely, limitation of the surgical sacrifice of functioning tissue and putting to work all possible means of assuring adequate oxygenation of the blood.

Lung cancer in the face of reduced pulmonary function may, on occasion, be handled satisfactorily by lobectomy alone. If lobectomy is not possible in a patient who cannot tolerate pneumonectomy, the surgeon should retreat without resection. In nontuberculous infections of the lung the surgeon may limit therapy to drainage and other procedures short of resection.

In pulmonary tuberculosis, when resection is contraindicated, thoracoplasty in stages still is of great benefit. Paradoxical respiration is a grave postoperative danger. Collapse procedures such as extrapleural pneumothorax have the advantage of being reversible should the patient not tolerate the degree of collapse created. Cavernostomy likewise is useful in severe respiratory insufficiency. In all of these procedures the dangers of pneumothorax and atelectasis in the postoperative period must be avoided.

Among measures leading to better oxygenation are preoperative instruction of the patient in the value of coughing and postural drainage. During operation the anesthetist, in addition to assuring oxygenation, must avoid flooding the tracheobronchial tree with blood and secretions. Selective intubation with the Carlens sound may be helpful. Anterior thoracotomy minimizes the contralateral spillage often seen in the patient in dorsolateral position.

During the postoperative period three complications are particularly dangerous: (1) Pleural collections of air and liquids, (2) tracheobronchial blockage, and (3) a nonrigid chest wall which is difficult to treat especially in young children. Breathing exercises under the supervision of a trained therapist are of great value in assuring maximum ventilation in the late postoperative period.

Prophylactic tracheotomy is reserved for (1) the emphysematous patient with expiration of less than 45 per cent who undergoes resection, (2) those patients subjected to extended removal of the chest wall, (3) patients with hypersecretion, and (4) known asthmatics undergoing resection. Less urgent indications are in pneumonectomy in the presence of compromised expiration, that is, between 45 and 60 per cent, soilage of the tracheobronchial tree of the patient with decreased function, and patients with cor pulmonale. Tracheotomy should be performed in the postoperative period whenever clinically indicated. Acute respiratory insufficiency is much easier to prevent than cure, and tracheotomy is a major preventive step.

Artificial ventilation with the Engstrom machine is reserved for the 20 per cent of patients who do not respond to tracheotomy and is not used prophylactically as a routine measure. Pulmonary thromboembolism has a tendency to develop in patients with pulmonary insufficiency, and tracheotomy has a prophylactic value. Among 74 prophylactic tracheotomies, no death occurred and no serious complications developed.

Further improvements in the field of respiratory insufficiency may be expected from the use of "respiratory hormones," such as acetazolamide drugs, which will improve oxygenation in the face of reduced oxygen supply. —*John H. Wulsin, M.D.*

Curative Treatment of Acute Postoperative Respiratory Insufficiency (Traitement curatif des insuffisances respiratoires aiguës postopératoires). M. RAPIN. *Poumon*, 1959, 15: 739.

IN ELEVEN INSTANCES of acute respiratory insufficiency that followed pneumonectomy and thoracoplasty, prompt therapy was directed towards the specific etiologic factors present. Tracheotomy and bronchial suction relieved 2 patients with atelectasis. In 3 patients acute asthmatic attacks were aborted with ACTH drip. In 6 other patients tracheotomy alone did not suffice, necessitating artificial ventilation. These patients all had arterial oxygen saturation values below 50 per cent.

Therapy was carried out with the Engstrom apparatus. Adaptation of the patient to the machine was helped with pure oxygen and the use of depressants. Blood pressure often fell after the patient was placed on the machine. In explanation of this decrease the author concludes that the rapid rise in oxygen tension of the blood was responsible, rather than the use of a depressant or the lowering of the carbon dioxide tension. Fortunately, noradrenalin reversed the hypotension. The rate of ventilation and the respiratory pressure must be adjusted to make up for the loss of resected parenchyma. With the use of artificial ventilation, oxygen saturation rapidly returned to normal, but CO_2 tension remained elevated for days before reaching its usual level. Blood gas analyses are essential for an adequate control of the patient on the machine, because, although symptoms of insufficiency may be relieved, profound chemical abnormalities may persist.

Gastric dilatation frequently accompanied the use of artificial ventilation and accordingly had to be relieved. Of 6 patients treated with the Engstrom machine, 2 died. —*John H. Wulsin, M.D.*

HEART AND PERICARDIUM

Experiences with Coarctation of the Aorta. CHARLES P. BAILEY, WILLIAM M. LEMMON, and BENJAMIN G. MUSSER. *Am. J. Card.*, 1959, 4: 775.

CLASSICALLY LOCATED coarctation with ligament—obliterated ductus arteriosus—accounts for 98 per cent of clinical cases which fall into this group and type with the ductus open just above the coarcted area and a left to right shunt. The remaining types include those with the ductus open to the lower segment, that is, right to left shunt, coarctation with hypoplasia of the descending aorta, isthmus interruption, that is, a patent ductus to the lower segment, and the unusually located coarctation of the ascending aorta, aortic arch, descending aorta, or at multiple sites.

The presence of an abnormal pressure differential between the upper and lower extremities is pathognomonic of coarctation of the aorta. In the usual types cross clamping, resection, and end to end anastomosis is proper. In the type with no effective collateral circulation, that is, in ductus to the lower segment, some form of temporary bypass or hypothermia is necessary. Venous approaches to these are presented.

Contraindications to surgery include acute or subacute bacterial endocarditis; the presence of congestive heart failure; advanced age; absence of symptoms in infants and children, in whom operation should be delayed until they reach the age of 6 or 8 years; and presence of associated serious congenital anomalies. Interrupted sutures for the anastomosis are used in children, whereas a continuous suture is permissible in the adult.

Fifty-eight patients were operated upon and resection of the stricture and end to end anastomosis was carried out in 56. In 2 patients subclavian to aortic anastomoses were made. One patient died, a 1.7 per cent mortality rate, of a hemothorax, staphylococcic empyema, and disruption of the anastomosis on the forty-first postoperative day. Of 51 patients followed up directly, 88 per cent had an excellent result; the others had a moderately satisfactory result. Preservation of all collaterals during operation is important. Aortography is rarely indicated. The authors believe that a supply of prosthetic grafts should be available and that combined procedures for the treatment of coarctation and aortic stenosis are feasible.

—Gabriel P. Seley, M.D.

The Significance of Anomalous Vertebral-Basilar Artery Communications in Operations on the Heart and Great Vessels. GEORGE I. THOMAS, KENNETH N. ANDERSON, RAYMOND F. HAIN, and K. ALVIN MERENDINO. *Surgery*, 1959, 46: 747.

THE AUTHORS report the case of a 26 year old male patient who was admitted for correction of an interventricular septal defect. Ligation of the left internal mammary and vertebral arteries and division of the left subclavian artery for arterial cannulation were performed in what appeared to be an uneventful correction of the defect but he failed to regain consciousness and died 45 hours after operation. At no time were there localizing cerebral signs or convulsions.

At autopsy the right vertebral artery was found to be considerably smaller in external diameter than the left and was bifurcated a few millimeters cephalad of the origin of the posteroinferior cerebellar artery. The smaller of its two branches contributed to the formation of the basilar artery, the external diameter of this vessel being considerably narrowed as it joined the left vertebral artery. Its second branch joined an anomalous anteroinferior cerebellar artery just distal to the latter's emergence from the basilar artery. Thus, the basilar artery received its blood supply almost exclusively from the left vertebral artery. The left posterior cerebral artery arose from the left internal carotid artery rather than the basilar artery. A very filamentous vessel connected the basilar artery with the left posterior cerebral artery. The right posterior cerebral artery was formed as a continuation of the basilar artery with a posterior communicating artery joining it with the right internal carotid artery. The anterior and middle cerebral arteries were normal and none of the vessels showed significant arteriosclerosis. Ligation of the left vertebral artery deprived the basilar system of its major blood supply and the anomalous contralateral vertebral artery and the other existing communications to the posterior circulation were inadequate to provide for the brain stem.

A review of routine autopsy material at the authors' hospital and an additional study of the vertebral-basilar artery communications in the autopsies of 70 adults and 20 infants and children uncovered excellent examples of vascular communications. In this series the right vertebral artery terminated as the right posteroinferior cerebellar artery with inadequate communication to the basilar artery in 3.1 per cent; the left vertebral artery terminated as the left posteroinferior cerebellar artery with inadequate communication to the basilar artery in 1.8 per cent. Aside from absent or inadequate contributions of the vertebral arteries there was in addition a wide variation in the size of the two vessels, the right being small in 9.7 per cent and the left in 5.7 per cent of cases.

On the basis of absent or inadequate communication one can predict that if the right vertebral artery is sacrificed, an acute midbrain syndrome will develop and death will occur in 1.8 per cent. If the left vertebral artery is sacrificed, 3.1 per cent of the patients will be so affected. For these reasons the femoral route for arterial cannulation for bypass procedures is advocated to avoid the mortality associated with sacrifice of the vertebral artery. When ligation of the subclavian artery proximal to the vertebral artery is practiced, the adequacy of retrograde vertebral flow is uncertain. Thus for both reasons the use of the subclavian artery for cannulation procedures would seem ill-advised. Potential hazards exist also in operations for coarctation when both the aorta and subclavian artery are occluded. In resection of aneurysms of the descending aorta or of the aortic arch when the subclavian artery may be occluded temporarily for bypass or ligated as in the Blalock-Taussig procedure for tetralogy of Fallot, a similar hazard exists. The use of the left atrium as a proximal takeoff source in the bypass procedures would avoid this difficulty. If the subclavian artery must be utilized, the vertebral artery should be left intact if possible and where the likelihood exists that sacrifice of this artery is necessary, a vertebral angiogram of the contralateral side is advocated.

—Allan D. Callow, M.D.

Angiographic and Pathophysiologic Aspects of Malformations of the "Tetralogy" Type (Quelques aspects angiocardiographiques et physiopathologiques des malformations du type de "la tétralogie de Fallot"). E. COELHO, E. PAIVA, A. NUNES, and S. SEQUERRA-AMRAM. *Sem. hôp. Paris*, 1959, 36: 477.

A NUMBER of congenital cardiac malformations present an identical clinical picture and common anatomic features: an interventricular communication and an obstruction to right ventricular outflow. These cases differ solely in the relative physiologic effect of these two features. Under the designation of "complex of the Fallot type" the authors group the following lesions: classic tetralogy of Fallot, pseudotruncus or pulmonary atresia, acyanotic tetralogy, and partial transposition of the great vessels associated with interventricular communication and obstruction of the right ventricular outflow tract, that is, infundibular or valvular stenosis.

The authors emphasize the fact that differentiation between these various lesions can be achieved only by angiocardiography. They present a number of angio-

graphic pictures and correlate them with the hemodynamic data. In particular, 1 patient with the classic physiologic findings of ventricular septal defect, pulmonary stenosis, and right to left shunt failed to show dextroposition of the aorta on angiography, demonstrating that the "overriding aorta" is not an essential feature of "tetralogy." —*Jonas Brachfeld, M.D.*

Surgical Obliteration of a Coronary Artery Fistula to the Right Ventricle. HENRY SWAN, JOHN N. WILSON, GEORGE WOODMARK, and S. GILBERT BLOUNT, JR. *Arch. Surg.*, 1959, 79: 820.

BECAUSE OF INCREASING INTEREST in anomalies of the coronary arteries and their surgical treatment, the authors submit a case report of a congenital fistula between the left coronary circumflex artery and the right ventricle. They also submit a revised classification which remains anatomic rather than functional. This is: (1) coronary artery aneurysm, without abnormal shunting of blood; (2) coronary arteriovenous fistula, with or without aneurysm; (3) coronary artery-intracardiac fistula, with or without aneurysm, to (a) right auricle, (b) right ventricle, (c) left auricle, (d) left ventricle; and (4) coronary artery-pulmonary artery fistula.

The patient was a 6 year old boy who was admitted in August 1958 with a continuous humming murmur maximal in the fifth interspace of the left sternal border. Previous catheterization studies led to a diagnosis of a fistulous tract between the low ascending aorta and the right ventricle, and at the time of admission a coronary artery to right ventricle fistula was considered as the probable diagnosis. At operation with the patient under hypothermia to 30 degrees C. and with total inflow-outflow occlusion lasting 5 minutes and 45 seconds at 31.5 degrees C., the lesion was found to be a congenital fistula between the left circumflex artery and the right ventricle. An unusual cardiac contour consisting of localized prominence in the area of the auricular portion of the left cardiac border was found at operation to be the dilated left circumflex artery as it rounded the left border of the heart. This is believed in retrospect to be an important diagnostic sign. Clamping the left circumflex artery proximal to the aneurysm produced gross visual changes and electrocardiographic evidence of severe myocardial ischemia, both of which quickly disappeared upon removal of the clamp. It appeared that ligation of the artery between the posterior descending branch and the fistula was technically impossible and direct vision endoaneurysmorrhaphy would be required. Accordingly the large fistula was closed into the right ventricle under direct vision. The authors believe this is the fourth reported case of this lesion which was correctly diagnosed before surgical exploration and the first case in which this lesion has been corrected under direct vision during hypothermia. —*Allan D. Callow, M.D.*

A New Principle in Extracorporeal Circulation (Ein neues Prinzip der Durchfuehrung des extracorporellen Kreislaufs). E. C. YASARGIL. *Thoraxchirurgie*, 1959, 7: 304.

THE NEW PRINCIPLE described by the author consists of an elevated total blood volume induced in the patient at the time extracorporeal circulation is begun, combined with a high flow perfusion system. The physiologic implications, structure, and function of the apparatus embodying this principle are discussed at length, as are the results of a preliminary series of experiments with 20 dogs.

In low flow systems for extracorporeal circulation, in which the total blood volume is relatively normal and the minute volume is reduced, the condition of the patient is analogous to that in compensated shock. Capillary circulation time in the vital organs is prolonged but volume flow is inadequate and, in time, the tissues become hypoxic. In high flow systems both total blood volume and minute volume are relatively normal. Capillary circulation time is, in practice, slightly reduced. Either rapid blood loss or vasomotor disturbance may rapidly reduce the effective total blood volume, with the result that capillary circulation time is reduced and adequate gas exchange no longer occurs.

Increasing the total blood volume in the patient at the time extracorporeal circulation with a high flow system is begun assures adequate minute volume through the vital organs, yields a prolonged capillary circulation time, and assures adequate oxygen transport to the tissues and improved oxygen dissociation during capillary flow. Blood loss produces no significant fluctuations in capillary circulation time, and the total blood volume and minute volume to vital organs remain adequate even though pooling and unphysiologic distribution of blood occur in these patients.

In the apparatus described, venous blood is brought to a reservoir from the venae cavae by a nonocclusive roller pump of special design which permits volume control in the reservoir and maintenance of the increased blood volume in the patient. As long as venous flow remains uninterrupted, slightly elevated venous pressure in the patient produces no damage.

A bubble oxygenator emptying on the overflow principle is used. Oxygen with 1 to 2 per cent CO_2 is warmed to 40 to 41 degrees C. before entering the oxygenator. Blood from the oxygenator passes through a flowmeter which, in effect, indicates the flow from the venae cavae. From the flowmeter, blood passes through a polyethylene net and filter to the arterial reservoir where the temperature is 34 to 35 degrees C. A nonocclusive roller pump operating on a double lumen tube at a low rate of revolution transports the oxygenated blood to the patient.

At the onset of extracorporeal circulation, the total blood volume of the patient is increased by about a third by means of blood from a reserve reservoir which feeds by way of the venous pump to the oxygenator. This same reservoir continually accepts blood sucked from the patient's heart during the procedure. At the end of the operation, before cardiac function is restored, the excess blood in the patient is let into the arterial reservoir through the arterial pump which has been placed on a nonocclusive setting. Reducing the patient's blood volume to slightly below normal at the conclusion of the operation avoids right heart failure. As cardiac function improves, this blood is transfused back into the patient, to restore his blood volume to preoperative levels. —*Elmer V. Dahl, M.D.*

The Recognition and Differentiation of Right Ventricular Pressure and Flow Loads. E. E. EDDLEMAN, JR., and H. DUKE THOMAS. *Am. J. Card.*, 1959, 4: 652.

THE PRESENT STUDY undertakes to delineate the value of records of precordial motion by kinetocardiography in the diagnosis of right ventricular predominance and to correlate the findings with cardiac catheterization data, electrocardiographic findings, and fluoroscopic observations in 20 patients with mitral stenosis, 11 with atrial septal defect, 2 with pulmonic stenosis, and 2 with isolated pulmonary hypertension.

The kinetocardiograms were abnormal in all patients studied, whereas the electrocardiograms were within normal limits in 29 per cent and fluoroscopy revealed no right ventricular enlargement in 26 per cent of the patients. Patients with significant pulmonary hypertension, regardless of its cause, had a prominent midsystolic outward movement of the precordium which was absent in patients with right ventricular flow loads without pulmonary hypertension.

From the studies presented it is concluded that the kinetocardiographic registration and probably precordial palpation are the most reliable methods of detecting abnormal right ventricular function.

—*Albert M. Schwartz, M.D.*

Hypothermia and Coronary Perfusion for Surgery of Atrial and Valvular Defects. FRANK J. COLGAN, JAMES A. DEWEESE, JAMES A. MANNING, and EARLE B. MAHONEY. *Anesthesiology*, 1959, 20: 811.

THIS REPORT explains the management of 30 patients under hypothermia and coronary perfusion who had open heart surgery for the repair of auricular septal defects and/or pulmonary valvular stenosis.

Patients selected for correction under this technique have had either a simple valvular pulmonary stenosis, an ostium secundum auricular septal defect, or one of the less complicated varieties of anomalous pulmonary venous drainage associated with a high auricular septal defect. The authors attempted to achieve an esophageal temperature of 30 degrees C. and to have the temperature on the rise at the time of circulatory occlusion. At the end of active cooling, rectal temperatures lagged behind the esophageal temperatures by as much as 1.7 degrees C. Consequently, the decision to remove the patient from the tub was based upon the esophageal temperature, regardless of the rectal temperature.

The electroencephalogram was an aid in maintaining a light plane of anesthesia during cooling and throughout the operation. An occlusion of 8 minutes might result in an abnormal electroencephalogram for about 1 hour. The average amount of citrated blood transfused during operation was 600 ml. per patient.

Postoperative complications were predominantly pulmonary and were most likely related to the bilateral anterior thoracotomy and the difficulty in effecting proper ventilatory function. The use of a right lateral thoracotomy incision for atrial defects or a longitudinal sternal splitting incision for pulmonary valvotomies appeared to reduce postoperative difficulties. Two deaths occurred in this series. Children usually require less than 30 minutes of additional anesthesia to be cooled to the desired temperature. Although the presence of two anesthesiologists is of value during induction of anesthesia and cooling, one can adequately manage a patient thereafter. Ventricular fibrillation remains the greatest single danger of open heart surgery under hypothermia. The authors state that their laboratory experiments indicate that perfusion rates of approximately half that of the normal coronary blood flow can prevent significant myocardial anoxia.

Hypothermia has proved to be an easily managed and predictable technique. The feasibility of this type of open heart surgery at the community hospital level is emphasized. —*Robert A. Nabatoff, M.D.*

Effect of Various Drugs on Spontaneous and Surgically Induced Ventricular Fibrillation in Hypothermia. B. G. COVINO, N. MARGOLIS, and H. E. D'AMATO. *Am. Heart J.*, 1959, 58: 750.

THE PRESENT STUDY is concerned with the evaluation of the effectiveness of three agents, ambonestyl (2-diethyl-aminoethyl-isonicotinamide hydrochloride), quinidine, and mephentermine sulfate, as antifibrillary drugs in hypothermia with and without the added complication of cardiac surgery. All three drugs have been shown to be effective against a variety of experimentally produced arrhythmias in normothermic dogs.

The authors believe that spontaneous ventricular fibrillation occurring in dogs rendered hypothermic is different from that which is produced by some forms of cardiac manipulation. They speak of one as spontaneous ventricular fibrillation and the other as surgically induced ventricular fibrillation, both in the hypothermic dog. Mephentermine in a dose of 3 mgm./kgm. significantly reduced the frequency of spontaneous ventricular fibrillation. Ambonestyl and quinidine were not effective. Mephentermine combined with either ambonestyl or quinidine exerted the same antifibrillary effect. Quinidine in a dose of 12 mgm./kgm. significantly reduced the surgically induced ventricular fibrillation of hypothermia, but ambonestyl and mephentermine did not.

The differential effect of quinidine and mephentermine on the two types of ventricular fibrillation and hypothermia is of interest in view of the fact these two drugs have been shown to alter the basic properties of normothermic cardiac muscle in opposite directions. Quinidine decreases excitability, decreases conduction velocity, and prolongs the refractory period. Mephentermine increases excitability, increases conduction velocity, and shortens the refractory period. The authors hypothesize that cardiac manipulation incites the firing of multiple ectopic foci which leads ultimately to disorganized fibrillary activity and that depression of ventricular excitability and/or lengthening of the refractory period should decrease this tendency toward ectopic beats and fibrillation. The results indicate that the two situations, spontaneous and surgically induced fibrillation in hypothermia, are not entirely similar; that prevention of one does not imply prevention of the other; and that the factors predisposing the heart to fibrillation are different in the two conditions. —*Allan D. Callow, M.D.*

Prevention of Posthypercapneic Ventricular Fibrillation in Dogs. BERNARD GOOTT and FLETCHER A. MILLER. *J. Thorac. Cardiovasc. Surg.*, 1959, 38: 630.

VENTRICULAR FIBRILLATION can be consistently produced in dogs, if, following prolonged hypercapnia, their arterial blood pH is rapidly raised to normal by ventilation with room air. This procedure offered a consistent and reproducible method of studying the metabolic alterations which might influence the production of ventricular fibrillation. To examine the influence of the cardiac sympathetic nerves an attempt was made to denervate the heart by means of bilateral sympathectomy and also to suppress the sympathoadrenal response by the use of dibenzyline, a sympathetic blocking agent. Neither sympathectomy nor the use of the dibenzyline prevented fibrillation or the metabolic alterations.

The administration of calcium ions successfully prevented posthypercapneic fibrillation in the animals tested, as did also the administration of magnesium sulfate. The administration of insulin successfully prevented fibrillation in all of 8 dogs treated. It suppressed the serum levels of both potassium and glucose during hypercapnia, but did not prevent the rise of phosphate ion. Corticoid preparations did not suppress the levels of serum potassium and inorganic phosphorus during hypercapnia. Quinidine failed to prevent fibrillation in 6 of 8 dogs.

—*W. Foster Montgomery, M.D.*

The Use of an Artificial Foraminal Valve Prosthesis in the Closure of Interatrial and Interventricular Septal Defects. RAMON LARIOS, EDWARD A. FITCH, GUMERSINDO BLANCO, and CHARLES P. BAILEY. *Dis. Chest*, 1959, 36: 631.

THE PROSTHESIS consists of a compressed ring of ivalon, a polyvinyl sponge, intimately fused to a 90 degree arc of a semiflexible compressed sheet of the same material which is shaped to form a cover over the hole in the ring. The ring portion is sutured to the edge of the defect, and the cover portion is allowed to swing in one direction only. By incorporation of a stronger fabric within the substance of the ivalon, its admirable qualities have been retained and the added strength forestalls deterioration.

Adult mongrel dogs were utilized to work out the technical details of valve insertion. Multiple microscopic sections taken through the region of implantation of the valve show healing proceeding gradually from a few days after implantation to its completion and closure of the defect about 3 to 4 weeks after operation. The prosthesis becomes encased within a layer of fibroconnective tissue with minimal foreign body giant cell reaction.

The prosthesis has been employed clinically in 9 patients with interatrial or interventricular septal defects or the tetralogy of Fallot. In these patients the ivalon prosthesis has been implanted in interatrial or interventricular communications instead of their being managed by the more conventional methods of closure. By providing a temporary vent between the heart chambers and protecting them from sudden increases in intracardiac pressures, this technique may prove useful in patients with large septal defects.

—*Robert A. Nabatoff, M.D.*

Surgical Treatment of Mitral Stenosis with Particular Reference to the Transventricular Approach with a Mechanical Dilator. ANDREW LOGAN and RICHARD TURNER. *Lancet*, Lond., 1959, 2: 874.

AFTER presenting a brief historical background of mitral surgery the authors discuss the difficulties of the atrial approach. The inaccuracy of the knife in cutting the commissure is described, and the authors believe that the transatrial knife has rarely made any useful contribution. The first attempts at the transventricular approach to the mitral valve used a short bladed tenotome. Subsequently a dilator was used through the ventricular approach and a modified larger form followed which was 5 cm. in spread. The thoracic incision should be carried more anteriorly, or the costal cartilages below the incision can be divided. The head of the dilator is placed in the orifice of the valve regardless of the axis of the valve. After the dilator is opened far enough to overcome the resistance offered by the valve it is withdrawn and its effect is assessed digitally.

In a comparison of the two methods, the use of the dilator resulted in complete division of both commissures in more cases and a decrease in the number of cases in which there was failure to completely divide either commissure. When a valvular calcification was present 23 per cent of the patients had complete anterior and posterior commissural division with the dilator, whereas only 11 per cent had been completed without the dilator. Heavy calcification is no contraindication to the use of the dilator.

Traumatic mitral incompetence occurred in 16 per cent of patients of the predilator group and in 19 per cent of those in the groups treated by the dilator. Four operative injuries have been caused by the dilator: rupture of chordae, detachment of the aortic cusp, rupture of the mural cusp, and deviation of the line of commissure resection. Deaths from cerebral embolism were reduced from 2.6 per cent to 1.4 per cent. Deaths from traumatic mitral incompetence increased from 1.0 per cent to 1.4 per cent. The overall operative mortality was 6.4 per cent as compared with 5 per cent, but more patients were improved. The authors believe that one cannot predict the results of operation by preoperative examination. They believe that the transventricular dilator is a valuable addition to the techniques of mitral valvotomy.

—*Gabriel P. Seley, M.D.*

Transventricular Mitral Valvotomy, Report of 50 Consecutive Cases. HUGH B. CRUM and M. J. C. TSAPOGAS. *Lancet*, Lond., 1959, 2: 880.

A REPORT of the authors' first 50 operations with the technique employed by Logan and the Tubbs dilator is presented. The spread is usually 4 cm. or less.

There were 3 deaths, 6 per cent in this series. Great improvement was noted. One patient reoperated upon did well with this technique. Four patients had mitral and aortic valvotomies; 1 died and 3 improved to full activity. Of 2 cases of embolism, 1 was fatal.

The authors believe that one should proceed to this method after rapid assessment of the valve and not after prolonged attempts at finger fracture on a hypoxic myocardium. Results are excellent and the method should gain favor. —*Gabriel P. Seley, M.D.*

Respiratory Changes in Mitral Stenosis. (Text in Greek). N. Tsamboulas, E. Oeconomides, S. Hatziconstantinou, and G. Hatzidimitriou. *Hellin. Iatriki*, 1959, 28B: 530.

The authors studied the respiratory function of 50 patients with mitral stenosis with minor or no insufficiency. The age of the patients ranged from 16 to 50 years with an average of 24 years. None of these patients had any other chronic pulmonary disease.

The vital capacity was found to be decreased by an average of 23 per cent and its subdivisions were decreased unproportionately. Maximum breathing capacity was also less than normal, as was the timed breathing capacity. The pulmonary reserves were found within normal limits.

These findings explain the persistence of respiratory symptoms even after commissurotomy. The factors contributing to the increase of the mechanical work of respiration in mitral stenosis are (1) decrease of lung compliance and the subsequent pulmonary fibrosis; (2) increased resistance of the respiratory muscles; (3) fatigue of the respiratory muscles; and (4) some degree of bronchospasm. The increase of respiratory ventilation at rest is considered as the first spirometric sign of mitral stenosis, often being present in otherwise asymptomatic patients. It is due to an increase of the respiratory rate.

—*Michael G. Seremetis, M.D.*

Surgical Treatment of Aortic Stenosis. Douglas Stuckey, R. G. Epps, and Ian Monk. *Med. J. Australia*, 1959, 2: 545.

Twenty-one patients were operated upon for aortic stenosis and all except 4 were between 40 and 60 years of age. Angina pectoris and effort syncope were two major symptoms specifically related to obstruction of the circulation. Left ventricular puncture was an important preoperative test.

Three young patients had open valvotomy. All of the older patients had transventricular closed aortic valvotomy. There were 3 operative deaths, 3 excellent results, 11 good results with 1 late death, 3 fair results with 1 late death, and 1 poor result in a patient who died 3 months after operation.

Tomography was useful in demonstrating the amount and distribution of calcification of the aortic valve. When heavy calcification is present, closed aortic valvotomy by the transventricular route has given satisfactory results in the authors' hands.

—*Gabriel P. Seley, M.D.*

Surgical Treatment of Ostium Primum and Atrioventricularis Communis (Canal atrioventriculaire et ostium primum, cure chirurgicale, d'après 25 observations). Ch. Dubost and Ph. Blondeau. *J. chir.*, Par., 1959, 78: 241.

Results of open heart surgery in 25 cases of atrioventricularis communis and ostium primum are reported. Nine patients were male, 16 were females, and ages ranged from 6 to 41 years. The authors believe that the two malformations are so similar that they are better grouped together. Of 20 true atrioventricular canals, exact preoperative diagnosis was made in 18. Of 4 patients with ostium primum, an ostium secundum was suspected in 2 adults with pulmonary hypertension because of right axis deviation in the electrocardiogram. One patient had ostium secundum and mitral insufficiency. The hemodynamic data were not helpful in defining the type of septal defect present, but the roentgenographic picture of the catheter across the septum frequently was diagnostic.

There were 6 deaths, 4 due to technical difficulties with the perfusion technique, 2 due to complete heart block. Two other patients with complete heart block survived and in 1 a sinus rhythm resumed. Of 19 survivors, 13 were followed up for less than 6 months, but general results were impressive even in those with preoperative pulmonary hypertension.

—*Jonas Brachfeld, M.D.*

ESOPHAGUS AND MEDIASTINUM

The Surgical Treatment of Peptic Esophagitis. Frederick S. Cross, George V. Smith, Jr., and Earle B. Kay. *J. Thorac. Cardiovasc. Surg.*, 1959, 38: 798.

One hundred thirty cases of peptic esophagitis are reviewed. Of these patients 103, 79 per cent, had an associated hiatus hernia and 27, 21 per cent, did not.

Sixty-five of the patients with hiatus hernia underwent hiatal hernia repair as definitive treatment. This consisted essentially of the Allison procedure. Fifty-eight of the 65 patients had a good result. Of the 35 patients with hiatus hernia treated medically, only 8 had good results. A course of medical treatment should always be given before operation, however, because some of the patients will respond.

In a group of patients with peptic esophagitis without hiatus hernia, medical treatment alone was fairly successful.

The authors believe that the cause of peptic esophagitis is essentially reflux of acid gastric juice through an incompetent cardiac sphincter, even though abnormalities of the sphincter mechanism cannot be demonstrated roentgenologically. With this belief in mind, the authors gave 7 patients without demonstrated hiatus hernia the benefit of reconstruction of the cardiac sphincter as performed in hiatal hernia repair. The results in the treatment of these 7 patients were uniformly good.

The importance of the accurate definition of terms and the proper classification of cases when dealing with this disease is emphasized. The fact is also mentioned that many series of cases in the literature give the results obtained from a variety of procedures performed on relatively few patients. For this reason, an accurate appraisal of the disease and its treatment has still not been made. —*Frank J. Milloy, M.D.*

Balanced Operations for Esophagitis Associated with Hiatal Hernia en Masse. Jacob K. Berman and E. Dale Habegger. *Arch. Surg.*, 1959, 79: 548.

After a previous article on the treatment of persistent esophagitis associated with esophageal hiatal hernia, the authors report their treatment of esophagitis associated with hiatal hernia en masse. This hernia should not be confused with hiatus hernia of the sliding or short esophageal type. Hiatal hernia en masse is a combination of hiatal hernia and parahiatal her-

nia. The latter, parahiatal hernia, has also been called paraesophageal or rolling type of hernia. Esophagitis is more common with hernia en masse, and the patients are older and more obese than those with the sliding type of hernia. Although esophageal hernia en masse may be asymptomatic, if associated esophagitis is present the usual symptoms include postprandial pain, substernal burning, dysphagia, and pyrosis. Dyspnea and anginoid attacks are frequent. Regurgitation and aspiration may occur with coughing, especially at night. Vomiting, hematemesis, and secondary anemia may also occur.

In a series of 190 patients with all types of hiatal hernia, the authors found that definitive surgical repair was required by 40 patients or 21 per cent. Seventeen members of the group operated upon had the sliding type of hernia. Four other patients were excluded from this report, leaving 19 patients on whom the authors performed a "one stage, balanced operation." The average age of patients was 56 years and 63 per cent were women. The balanced operation consists of (a) restoration of the normal position of the esophagus and stomach; (b) bilateral vagotomy to reduce the usually present gastric hyperacidity; (c) restoration of a normal esophagogastric angle by esophagogastropexy; (d) pyloroplasty to facilitate gastric emptying, and thereby reduce intraluminal pressure; and (e) the surgical correction of any associated disease. These operations have been performed in a single procedure on 19 consecutive patients with consistently good results in a follow-up period of 1 to 8 years. —*Emile L. Meine, Jr., M.D.*

Hemorrhage as a Complication of Reflux Esophagitis. Robert V. DeVito, Mark B. Listerud, Lloyd M. Nyhus, K. Alvin Merendino, and Henry N. Harkins. *Am. J. Surg.*, 1959, 98: 657.

Bleeding from peptic ulcers in the squamous mucous membrane of the esophagus due to reflux esophagitis is generally considered to be of a slow chronic nature, and seldom rapid or massive. Experience with a case of massive hemorrhage from ulceration of the squamous epithelium of the esophagus, however, led the authors to search their hospital records; they were able to discover a second similar case. These 2 cases, combined with an analysis of the literature, forms the basis of this report.

Eleven authors presented a total of 780 patients, all of whom had the common feature of symptomatic reflux esophagitis. Of these patients, 208 or 27 per cent gave a definite history of "gross" bleeding in the form of hematemesis or melena. Eighty-six patients or 11 per cent had "severe" bleeding that depressed their hemoglobin content to less than 10 gm. and/or required blood transfusion. Excluding one series in which there was not a full description of the severity of the bleeding, "massive" hemorrhage occurred in 33 of 650 patients, an incidence of 5 per cent. More significantly, massive hemorrhage occurred in 20 per cent of patients having gross bleeding. There was a total of 5 deaths from hemorrhage reported in the combined series of 780, an over-all incidence of 0.6 per cent or an incidence of 15 per cent among those patients who were bleeding massively.

It is apparent that reflux esophagitis becomes a threatening disease once hemorrhage has occurred. Definitive operative therapy should be considered earlier than is generally the case and must be considered when bleeding becomes a prominent symptom during the course of the medical treatment. In the great majority of patients, the basic problem is reflux of gastric juice into the esophagus, usually with an associated sliding hiatal hernia. Therapy for esophagitis, therefore, is directed at reducing the digestion of esophageal mucosa by acid peptic fluid. The authors believe that while the musculature of the lower esophagus may act like a muscular sphincter, the architecture of the esophagogastric junction acts to protect or aid this sphincter. It is therefore imperative that when a sliding hiatal hernia is present, esophagitis should be treated by repair of the hernia with restoration of normal architecture wherever possible. Individuals having a recurrence of symptoms after adequate repair, or who at the time of repair have particularly severe esophagitis or associated duodenal ulcer should be given the added protection of a procedure designed to reduce the volume and acidity of gastric juice. Vagotomy with pyloroplasty is preferred. Jejunal interposition may be advisable for the patient who has not responded to vagotomy and pyloroplasty, with or without hiatal repair, or who has progressed to marked stricture formation when first seen.

Patients with acute and massive upper gastrointestinal hemorrhage and a history compatible with esophagitis should undergo esophagoscopy. If the source of bleeding is identified in the esophagus, balloon tamponade or packing with oxycel may prove lifesaving. Emergency suture ligature of the bleeding point or resection may then be indicated. Emergency operation on the distal end of the esophagus to control bleeding from esophagitis is a difficult procedure, since the esophageal wall is greatly thickened and inflamed. —*Glenn E. Behringer, M.D.*

Thymic Tumors (Considerazioni anatomocliniche e radiologiche sulle neoplasie del timo). E. Bullo, E. De Donato, T. Rock, and C. Sirtori. *Tumori*, Milano, 1959, 45: 429.

The authors report the cases of 10 patients with thymic tumors treated at the Tumor Institute of Milan, Italy. Seven of these tumors were thymomas, 1 a lymphosarcoma, 1 a lymphoepithelioma, and 1 a cylindrocellular carcinoma. The age of patients varied from 32 to 62 years.

The initial symptom was first noted at 10 years of age in 1 patient and at 5 years in a second. In the remainder the age varied from 40 days of age to 3 years. Two of the tumors were discovered on routine examinations.

In 7 patients the principal symptom was cough. Other symptoms were suffocation, venous engorgement, hematologic disturbance, fever, and epistaxis.

Myasthenia was present in 2 patients. In 1 of these the duration was 3 years, and after prostigmine therapy the patient was able to carry a pregnancy to term.

The tumor was located in the anterosuperior mediastinum in 4 cases, in the anteroinferior mediastinum in 3, and in the pulmonary mediastinum in 1.

Three patients were operated on and the tumor was excised. Two are still living after 3 and 4 year

intervals and in the third there is evidence of recurrence at the end of 9 months. In 6 cases biopsy alone was performed and 1 case was found at autopsy.

The authors point out that the thymomas present a typical histologic picture. Myasthenia gravis is found in association with more differentiated tumors. The location of the tumors varies greatly; they can be found almost anywhere in the mediastinum. Symptoms may be absent for long periods and the evolution of the tumors is slow. The treatment of choice for circumscribed tumors is surgery followed by irradiation therapy if excision beyond the tumor is not possible. Roentgenologic therapy is recommended for inoperable cases and those in which there is mediastinal compression. —*Lucian J. Fronduti, M.D.*

The Value of Pneumomediastinum in the Differential Diagnosis of Mediastinal Lesions (Der Wert des Pneumomediastinums bei der Differentialdiagnose mediastinaler Erkrankungen). J. LISSNER. *Fortsch. Roentgenstrahl.*, 1959, 91: 445.

CONDORELLI'S TECHNIQUE of producing pneumomediastinum consists of the retrotracheal insufflation of oxygen. Four hundred cubic centimeters usually suffices to delineate the mediastinal structures and any tumors that may be present.

In a series of 39 patients the author found this technique of value in determining the origin of mediastinal masses. Planigraphy and kymography, in conjunction with pneumomediastinum, are helpful in this regard. In addition to being of value in the diagnosis of mediastinal tumors, pneumomediastinum can occasionally be of value in determining the extent of spread of a bronchogenic carcinoma and lesions of the heart and great vessels.

The technique is easy to perform and has not been attended by serious complications. Several case reports with photographs of the pertinent roentgenograms are presented. —*J. C. Rosenberg, M.D.*

The Diagnosis and Classification of Mediastinal Masses, a Study of 782 Cases. HAROLD A. LYONS, GEORGE L. CALVY, and BILLY P. SAMMONS. *Ann. Int. M.*, 1959, 51: 897.

THE AUTHORS STUDIED 782 mediastinal masses seen at the United States Naval Hospital, St. Albans, New York and Kings County Hospital, Brooklyn, New York. They advocate that each patient have certain diagnostic procedures in order to establish a diagnosis, whether the lesion is malignant, benign, or a vascular mass and to determine whether or not its removal gives a prospect of cure. If this is done, some patients may be spared unnecessary surgery.

Roentgenologic examination is by far the most informative nonsurgical procedure available to the clinician. The greatest number of preoperative diagnoses were made of tumors with well known roentgenologic characteristics, such as lymphomas, neurogenic tumors, and teratodermoids. Practically speaking, teratodermoids and thymomas are seen in the anterior mediastinum; granulomas, lymphomas, and vascular lesions are most commonly seen in the middle mediastinum; and neurogenic tumors in the posterior mediastinum. In addition to the usual roentgenographic examination and fluoroscopy, scalene node biopsy has been sufficiently helpful in a significantly high number of patients to warrant its routine use. Its greatest value has been in lymphomas, granulomas, and mediastinal and pulmonary tumors. Angiocardiography has reduced the number of instances in which thoracotomy is necessary for the diagnosis of a nonresectable vascular lesion.

The authors state that the majority of mediastinal lesions will require thoracotomy, as this procedure allows complete excision, a definite histologic diagnosis, and information regarding prognosis. The authors advise that this procedure not be delayed in the diagnostic workup of the patient with a mediastinal mass. Therapeutic irradiation for diagnostic purposes is mentioned only to be condemned. Of the 782 patients studied the greatest number had lymphomas (203 cases) and granulomatous disease (278 cases).
—*John J. Hudock, M.D.*

MISCELLANEOUS

Herniation Through the Foramen of Morgagni. W. R. HUNTER. *Brit. J. Surg.*, 1959, 47: 22.

FIVE CASES of herniation through the foramen of Morgagni are presented. The condition is infrequently reported and the author found only 44 cases in a review of the literature up to 1951. He believes the condition will more frequently be diagnosed with the increased use of the routine roentgenograms of the chest.

When present, the foramina of Morgagni are situated at the anterior edge of the diaphragm on either side of the falciform ligament. The opening is usually unilateral and situated more commonly on the right, although it may be left sided or bilateral. There is always a sac in this type of hernia.

Although the exact cause of this condition is not known, it is probably due to the enlargement of a small defect which normally occurs at the point of passage of the internal mammary artery under the edge of the diaphragm into the abdomen where it becomes the superior epigastric artery. This small space, which is normally filled with areolar tissue, is known as Larrey's space.

According to the literature, there appears to be some relationship between this hernia and other developmental abnormalities, particularly malrotation of the midgut.

The majority of reported cases have been in adults, frequently in the elderly. While in the younger age group males predominate, there is an increasing number of females in the older age group.

Five cases reported in this series were in elderly females, the average age being 72 years. The diagnosis should be suspected whenever an abnormal shadow is seen by roentgenogram in the right cardiophrenic angle, whether or not symptoms are present. The operation is extremely easy when performed from below, and the author emphasizes the ease with which the hernia may be reduced. On the other hand, an attempted hernia repair from above may be awkward. For this reason, it is important to make the diagnosis before surgery by the aid of barium studies or even by the induction of pneumoperitoneum. —*Frank J. Milloy, M.D.*

Instantaneous Blood Loss Determination During Thoracic Surgery. ROBERT KLOPSTOCK, HARRY H. LEVEEN, and P. I. LEVITAN. *J. Thorac. Cardiovasc. Surg.*, 1959, 38: 746.

AN APPARATUS is described which may be used to measure the amount of blood lost during a surgical operation. The essential requirement of the method is that all bloody sponges, blood clots, and aspirated blood be emptied into the tublike appliance which has previously been partially filled with water.

Inasmuch as blood is a solution of almost constant electrolyte composition, the electrical conductivity of the mixture of blood and water will increase according to a predictable curve in direct proportion to the amount of blood added. The changes in electrical conductivity of the solution are measured by means of a Wheatstone bridge, and a dial on the face of the apparatus records these changes in electrical conductivity in terms of cubic centimeters of blood lost.

The solution is continually agitated and correction is made for temperature changes. When further corrections have been made for severe anemia or serum protein abnormalities, the readings are said to be accurate to 0.5 per cent.

It should be noted, however, that electrolytic solutions such as normal saline cannot be used for wound irrigation or moistening of sponges during the procedure unless they are accurately measured and appropriate corrections are made.

The authors discuss the advantages of the correct estimation of blood loss and illustrate the importance of this factor in the etiology of shock by means of several case presentations. They state that this method will be of particular value in hypothermia, in which vital signs are valueless in gauging blood loss.

—*Frank J. Milloy, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Diagnosis of Left Sided Subphrenic Abscess. MARTIN C. ROSNER and MORTON A. BOSNIAK. *J. Am. M. Ass.*, 1959, 171: 1282.

NINE DAYS after subtotal gastrectomy for duodenal ulcer, intestinal obstruction developed in a male patient, necessitating another laparotomy for lysis of adhesions. Eleven days after the second operation he had spiking temperature, left thoracic discomfort, and left shoulder pain; a chest roentgenogram showed a fluid level at the base of the left lung. After removal of fluid from the left pleural cavity, roentgenograms revealed a fixed, elevated left diaphragm. After air was introduced into the stomach by the administration of a carbonated beverage, roentgenograms showed inferior displacement of the stomach remnant by a subphrenic mass. Systemic antibiotic therapy was ineffective. Drainage of the subphrenic space 3 weeks after the second operation yielded pus containing hemolytic Staphylococcus aureus. The patient made an uneventful recovery after drainage and chloramphenicol therapy.

Left subphrenic abscess, characteristically (1) follows surgery for peptic ulcer or biliary tract disease; (2) is manifested by fever, leucocytosis, and tenderness over the chest wall; and (3) is associated with pleural effusion over a fixed diaphragm. Adequate roentgenologic study implements the clinical diagnosis. The significant finding is an air-fluid level beneath the diaphragm which can be delineated nicely by filling the stomach with barium, or preferably, as the authors showed, by inflating it with air or carbon dioxide, the gases having the advantage of being easier to withdraw. Treatment is surgical drainage of the abscess. —*Edwin J. Pulaski, M.D.*

Surgical Considerations in Hiatus Hernia. J. K. CLAREBROUGH and J. L. CONNELL. *Austral. N. Zealand J. Surg.*, 1959, 29: 21.

TWO BASIC TYPES of hiatus hernia are described: (1) the sliding type in which the esophagocardiac junction is displaced cephalad to a varying level in which there is a peritoneal sac only anterior and lateral to the stomach, and (2) the paraesophageal type in which the esophagocardiac junction remains in its normal location and the stomach rolls up along the side of the esophagus.

Repair of the hernia from below the diaphragm relies on suturing of the phrenicoesophageal ligament to the ring of the hernia and by carefully closing the crura posteriorly.

Mechanical and digestive complaints are the chief symptoms. Of importance is the fact that 43 per cent of 150 patients observed had hemorrhage of varying degrees.

Indications for surgery are (1) failure of medical treatment; (2) hematemesis or other manifestations of bleeding; (3) esophageal complications; (4) complications in the gastric pouch; or (5) associated disease.

There is no general agreement as to whether the thoracic approach or the abdominal approach is the better. When there is advanced pulmonary disease or other intra-abdominal pathologic condition that requires care, the abdominal approach is preferred. When the hernia is large and irreducible or when there have been permanent esophageal changes, the thoracic approach is indicated.

—*Harold M. Unger, M.D.*

Experience and the Use of the Zimmerman Type of Hernioplasty, a New Concept of the Transversalis Fascia. ROSS Z. PIERPONT and WALFRIDO G. FERNANDEZ. *Am. Surgeon*, 1959, 25: 751.

THE AUTHORS have used standard hernia repairs for inguinal hernias for the last 14 years and find them inadequate for the proper correction of the hernia defect.

In October 1954 they adopted the repair of Zimmerman. This technique employs the usual inguinal hernia incision, but the external oblique fascia is carefully cleared and bared for a considerable distance. The rolled edge of the inguinal ligament is also carefully cleaned, and the ilio-inguinal and iliohypogastric nerves are indentified and preserved. A lateral flap of aponeurosis is then made by incision from the medial third of the external ring obliquely outward toward the inguinal ligament in the region of the abdominal inguinal ring. The undersurface of the medial flap of aponeurosis is carefully cleaned, the spermatic cord is elevated from its bed, and the transversalis fascia is identified. An evaluation is then begun by carefully checking the floor of the inguinal canal for any defects.

The cord is then stripped of its coverings by removing the cremasteric and internal spermatic fascia from above downward. Anteriorly, medially, and laterally this can be done by blunt dissection but posteriorly the inferior epigastric branches must be ligated with 00 chromic catgut. Any excess fat or lipomas are also removed, thus diminishing the size of the cord. The sac is then found and ligated with No. 1 chromic catgut. The shelving border of the internal oblique and conjoined tendons are elevated with a retractor and the transversalis fascia is identified and cleaned. Two possible anatomic situations may be present. An entirely separate sheet of transversalis fascia may be interposed between the peritoneum and transversus abdominus muscle, in which case there will be no muscle fibers to deal with in the repair; or the transversalis fascia may be represented by only an extension of the ensheathing fascia of the transversalis muscle which is carried medially to insert in the pubic tubercle and inguinal ligament.

The transversalis fascia is then sutured snugly to the inguinal ligament so that a Kelly clamp alone can be introduced into the internal inguinal ring. Occasionally a suture superior to the cord must be added to properly fix the internal ring. This repair is then carried to the pubic tubercle and, if an in-

direct hernia is the only problem, the cord is replaced and the aponeurosis sutured over it with 0 chromic catgut.

In the direct hernia, the lateral triangular flap of aponeurosis is sutured over Hesselbach's triangle beneath the cord, the cord is replaced in the new bed and the medial flap of aponeurosis is sutured to the outer edge of the inguinal ligament, and the skin is closed with clips.

There were 200 consecutive hernia repairs in 157 male patients more than 3 years of age over a 4 year period. All were primary repairs: 155 indirect hernias, 16 direct hernias, and 29 direct-indirect hernias. The recurrence rate was 2.5 per cent, primarily in the patients with direct hernias. The authors believe that this hernioplasty offers a fundamentally sound anatomic approach to the problem of inguinal hernia with a minimum of recurrence and complications.

—*David E. Hallstrand, M.D.*

Y-Scrotoplasty in Repair of Huge Inguinoscrotal Hernia. Donald R. Davis and Christopher Y. Thomas. *Missouri Med.*, 1959, 56: 1246.

In the repair of huge inguinoscrotal hernias it is oftentimes important to remove a portion of the scrotum. It is suggested that the large redundant scrotum may present postoperative problems from the standpoint of hygiene, comfort, and appearance. If the large, empty scrotal sac remains after the hernia repair, accumulation of serum, possible infection from contamination from the anal area, and other considerations make the authors believe that the removal of excessive scrotal skin is of benefit.

It is the authors' practice to perform Y-scrotoplasty on all patients coming to operation for huge inguinoscrotal hernias, especially when concomitant orchiectomy has been a part of the hernia repair. In this operation, most of the skin on the anterior portion of the scrotum covering the large hernia is excised; after repair of the hernia is accomplished the large circular incision is closed so that the eventual suture line appears as an inverted Y.

Photographs accompany the article as well as line drawings indicating the extent of the surgical procedure and the method by which the plastic repair in the scrotal sac is accomplished. The complications of the procedure are not discussed. The one patient pictured in the article appears to have had an excellent result.

—*Orville F. Grimes, M.D.*

GASTROINTESTINAL TRACT

Tube Gastrostomy in Abdominal Surgery. William J. Gillesby and Charles B. Puestow. *Am. Surgeon*, 1959, 25: 927.

Gastrostomy by various methods has been used for many years in esophageal obstruction. In recent years it has been revived for use as a substitute for nasogastric intubation.

The authors, at the Veterans Administration Hospital in Hines, Illinois, studied 15 patients and found that when the nasogastric tube was in place, the volume of fluid recovered from the gastrostomy tube averaged 750 c.c. more per 24 hours than when the gastrostomy tube was used alone.

Particularly in the elderly and in the young, the constant irritation from the nasogastric tube in the esophagus and throat increases secretion, which may and frequently does find its way into the tracheobronchial tree. The use of the gastrostomy tube has lessened the pulmonary complications in these surgical patients.

The complaint of "heartburn" was more common in patients with a nasogastric tube in place than in those with a gastrostomy tube. With certain patients it appeared that there was reflux of gastric juice up into the throat along the sides of the nasogastric tube.

Present indications for the gastrostomy tube on the authors' surgical service are: all esophageal resections, all gastric resections, gastroenterostomies, pyloroplasties, operations for perforated peptic ulcer, and operations for gastric or duodenal hemorrhage. The gastrostomy tube is also used when operation has been performed for intestinal obstruction and in all cases of acute pancreatitis in which the abdomen has been opened.

A No. 24 French, Foley catheter with a 5 c.c. bag has proved satisfactory and has not produced complications. The stomach is sutured to the peritoneum of the anterior abdominal wall at the site of exit of the catheter from the stomach. Suction on the gastrostomy tube is continued as long as is necessary, and the tube is then clamped and tested at 4 to 6 hour intervals to determine whether there is gastric retention. The authors have usually removed the tube on the tenth day and believe that leaving it in place for 10 days is an added safety factor.

—*Gilbert S. Campbell, M.D.*

The Best Technique in Gastrectomy for Ulcer. V. J. Kinsella. *Austral. N. Zealand J. Surg.*, 1959, 29: 54.

This author gives a very authoritative if somewhat controversial review of what he considers the best technique for gastrectomy. There is also an interesting and important review of the history of gastric surgery from the days of Gussenbauer and Billroth to the present.

There can be no argument with his emphasis on care and gentleness, a minimum of tissue trauma, patience and persistence, perfection in hemostasis, and precision in reconstruction and suturing. He describes a number of the finer points in technique which have universal acceptance, for example, careful packing off of the field to avoid contamination of the subphrenic spaces when the stomach is open and the avoidance of blood loss and of crushing or gross sutures. Exception may be taken to undersewing the submucosal vessels rather than clamping them, to division of the gastroepiploic arch between the stomach and the arch rather than distal to the arch, to closure of the serosa and submucosa of the duodenum without closure of the mucosa, to antecolic anastomosis, to his insistence on an antecolic anastomosis with the afferent loop at the lesser curvature, and to some of the details of the postoperative care.

The mortality rate in the author's series of 335 cases was 1.2 per cent, with 4 deaths in 33 cases of bleeding. His evaluation of the late results and of stomal ulceration is not clearly stated. The main conclusion from reading this article is that a physiologi-

cally sound procedure will prove effective and safe when carefully and conscientiously carried out.

—*Harold M. Unger, M.D.*

Gastrectomy for Massive Gastrointestinal Hemorrhage of Unknown Cause. JOHN BRUCE and H. A. F. DUDLEY. *Lancet*, Lond., 1959, 2: 992.

"BLIND GASTRECTOMY" is defined as a standard two-thirds to three-fourths gastrectomy carried out on account of massive hemorrhage when an obvious lesion is not present on external examination or on palpation of the stomach and duodenum. For the purposes of analysis, patients are included who, under such circumstances, were subjected to preliminary gastrotomy, with or without identification of the bleeding point by this means.

This review presents the surgeon's viewpoint in massive gastrointestinal bleeding of unknown cause. Many of this group of patients, whose bleeding is less severe, recover with medical treatment. Results suggest, however, that lack of a clear history of digestive upset does not preclude the existence of a superficial ulcer, usually gastric but occasionally duodenal, from which fatal bleeding will occur if gastrectomy is not undertaken. A subtotal gastric resection will remove the lesion in 75 per cent of patients and will arrest the bleeding in the majority of the remainder. The over-all mortality in this group should be not more than 10 per cent. If massive bleeding continues after gastrectomy, only reoperation is likely to save the patient.

—*Benjamin Goldman, M.D.*

Antecolic Gastrojejunostomy After Gastric Resection (Risultati immediati ed a distanza in 80 operati di resezione gastroduodenale e gastrodigiunostomia antecolica su un complesso di 787 resezioni per ulcera gastrica e duodenale). ETTORE PRETTO and NADIA RANDI. *Fracastoro*, 1959, 52: 368.

THE AUTHORS report on 80 cases of antecolic gastrojejunostomy after gastric resection. The operation of choice for gastroduodenal ulcer at the Civil Hospital in Verona, Italy for some time had been a gastric resection with transmesocolic anisoperistaltic oralis inferior anastomosis. However, after noting some favorable reports of the antecolic anastomosis, the authors decided to perform this type of anastomosis in 80 consecutive patients. From 1950 to 1958 a total of 787 resections was performed. Of these, 602 were performed with a transmesocolic anastomosis. From October 1956 to July 1957 80 consecutive operations were performed with the anticolic anastomosis. In an additional 102 cases the antecolic anastomosis was performed not as a matter of choice but as a necessity because of anatomic difficulties.

The authors limit this report to the 80 cases in which antecolic anastomosis was elected. They were able to follow up 74 patients directly and the remaining 6 were followed up by mail. Forty-one of the patients were classified as having had optimum results, 27 good, 7 mediocre, and 5 unsatisfactory. Of the unsatisfactory results, a stasis syndrome of the afferent loop developed in 2 patients, an anastomotic ulcer in 2 patients, and an ulcer in the efferent loop of the jejunum in 1.

The authors have returned to the transmesocolic type of anastomosis and use the antecolic when the mesentery is short or very thick, or when there are posterior adhesions. The authors believe that all methods which show satisfactory results after sufficient experience are good. It is preferable to be able to use several methods than to resort to one method in all cases.

—*Lucian J. Fronduti, M.D.*

Changes in the Plasma Volume During the Development of the Dumping Syndrome. (Text in Greek). E. FOKAS, K. ZEUGOLATIS, F. KAKLAMANIS, and A. SKEBEAS. *Hellin. Iatriki*, 1959, 28B: 538.

THE AUTHORS studied the changes in the plasma volume after the administration of 150 c.c. of 50 per cent glucose solution to postgastrectomized patients and normal individuals. There were 20 patients in the series who had undergone gastrectomy because of peptic ulcer, 19 of them subtotal gastrectomies and 1 total. Six normal individuals were used as controls. Seventeen of the gastrectomized patients were complaining of symptoms of early dumping syndrome while the remaining 3 were asymptomatic. The operation had been performed a few months to a few years prior to the study.

The plasma volume was measured indirectly by hematocrit determinations before and at various intervals after the administration of glucose. In 8 patients determinations were made 40 and 120 minutes afterward, while in the remaining 12 patients and the 6 control individuals the hematocrit was determined every 10 minutes for 1 hour and every 20 minutes for 3 more hours. All the patients were in sitting position during the test; symptoms were recorded and timed.

When the results were evaluated, the patients were divided into two groups depending upon whether or not they had symptoms of the dumping syndrome. The first group included 15 gastrectomized patients who did have symptoms of varying intensity. Patients having previous dumping reported that the symptoms they had after the test were similar to the spontaneous ones. In 12 patients the syndrome appeared within 5 to 10 minutes after the ingestion of glucose and in 3 after 10 minutes. The symptoms lasted from 35 to 70 minutes. All patients in this group showed increased hematocrit and hemoglobin values and an increased number of red blood cells. The hematocrit increased from 3.5 to 6 per cent in the first 6 patients and from 3.5 to 10.5 per cent in the other 9 patients. The changes occurred within 5 minutes after the administration of glucose in 4 patients and within 5 to 10 minutes in the remaining patients. The dumping symptoms appeared at the time of the hematocrit changes and were more intense at their peak. There was correlation of the severity of symptoms and the degree of the hematocrit changes.

In the second group of 5 gastrectomized patients neither the syndrome nor changes in the plasma volume appeared. The individuals of the control group showed no significant hematocrit changes.

The authors conclude that the development of the dumping syndrome is closely related to the decrease in plasma volume, apparently resulting from the movement of fluid from the plasma into the jejunum in order to bring about osmotic equilibrium.

—*Michael G. Seremetis, M.D.*

The Relation of the Morphology of Gastric Carcinoma to Long and Short Term Survival. CLIFFORD H. URBAN and GORDON MCNEER. *Cancer*, 1959, 12: 1158.

THE AUTHORS present certain morphologic features observed in 2 groups of patients with gastric cancer who were selected because they differed in their length of survival after surgical treatment designed for cure. The study is concerned with the gross and histologic data on 91 patients with gastric cancer who underwent potentially curative operations at the Memorial Center for Cancer and Allied Diseases, New York, New York between 1930 to 1950. Thirty-eight of these patients survived more than 5 years; 53 died within 1 year of treatment.

Five morphologic features of each case were tabulated: (1) the maximum diameter of the tumor; (2) the histologic grade; (3) penetration into the gastric wall, including the pattern as well as the depth of the growth; (4) composition of the tumor with respect to the proportion of signet ring cells present; and (5) the presence or absence of metastases to lymph nodes.

Characteristic morphologic features were associated with the majority of patients who survived more than 5 years after treatment and were different from those characteristic of the majority of patients who died less than 1 year after therapy. The majority of patients who survived 5 or more years after treatment had tumors with some or all of the following morphologic characteristics: A gross size of 5 cm. or less in diameter; a low histologic grade; growth confined to the gastric wall; an en bloc growth pattern; an absence of lymphatic metastases; a minority of cells of the signet ring type.

The composite picture of a tumor in the majority of the short term survivors included large size, more than 5 cm. in diameter; anaplasia; growth in the single cell pattern; and penetration through the serosa. The majority of the tumor cells were of the signet ring cell type and lymphatic metastases were frequent. The features characteristic of short term survivors were rarely seen in the long term survivors. Criteria for picking the short term survivors are more easily developed and have a greater apparent accuracy than do the criteria for choosing long term survivors.

The three most dramatically different features between the short and long term survivors, and therefore to be considered as potential prognostic criteria, are the depth of penetration of the tumor into the gastric wall, lymph node metastases, and the pattern of growth. The latter feature is the most striking factor separating the long and short term survivors and helps to confirm the concept of growth pattern as a fundamentally important characteristic of tumor structure. —*James H. Holman, M.D.*

The Clinical Behavior and Management of Primary Malignant Lymphoma of the Stomach. GORDON MCNEER and JOHN W. BERG. *Surgery*, 1959, 46: 829.

PRIMARY as opposed to secondary malignant lymphoma is a rare gastric neoplasm comprising 2.2 per cent of all malignant tumors of the stomach seen at the Memorial Center for Cancer and Allied Diseases, New York, New York. Thirty-six cases were observed in the years 1935 to 1956. They were classified pathologically as lymphocytic, reticulum cell, and intermediate lymphomas. Primary gastric Hodgkin's disease was not observed. On roentgenographic examination the great majority of lymphomas of the stomach present no distinguishing feature to differentiate them from gastric adenocarcinomas. Approximately 10 per cent of primary gastric lymphosarcomas, however, show diffuse enlargement and fixation of the mucosal folds on roentgenographic examination.

All of the patients underwent laparotomy with a view to curative surgery which was performed in 31 of the 36, a curative resectability rate of 85 per cent, which is more than twice that for cancinoma. A subtotal gastric resection was performed in 17 patients; total gastrectomy was required in 14 because of the extent of the tumor. The operative mortality rate was 22 per cent. The absolute 5 year survival rate is 35 per cent. Five of the 7 5 year survivors received irradiation, and the authors believe that radical surgery plus irradiation therapy is the most effective form of treatment. —*Harvey W. Baker, M.D.*

Newer Physiology of Absorption from the Intestine. RICHARD J. REITEMEIER. *Ann. Int. M.*, 1959, 51: 993.

ABSORPTION of many substances from the small intestine is only partially understood. The forces regulating passage of materials from intestine to blood and from blood to intestine are complex and difficult to investigate. The fat balance technique has not been equaled by the radioiodinated triolein method as a means of detecting steatorrhea of mild or moderate degree. When comparison is made of absorption of I^{131} triolein and of I^{131} oleic acid, the distinction between an absorptive and a digestive defect may be possible. The use of Co^{60} vitamin B_{12} has helped to elucidate the mechanism responsible for macrocytic anemia in certain abnormalities of the small bowel. A method is available allowing quantitation of rates of absorption of isotopic water and certain electrolytes under physiologic conditions.

The Effect of Temperature on Intestinal Motility. P. A. SALMON, W. O. GRIFFEN, JR., C. B. JENSON, and O. H. WANGENSTEEN. *Surgery*, 1959, 46: 873.

DEPRESSION of bowel activity has been shown in bullfrogs, rats, and rabbits after systemic or local hypothermia. In rabbits, local hypothermia below 38 degrees C. and optimally at 30 degrees C. reduces the rate of secretion in bowel and stomach, slows the absorption of drugs such as strychnine, and interferes with the systemic parasympathomimetic action of drugs on bowel activity. —*Edwin J. Pulaski, M.D.*

Gastrointestinal Hemorrhage from Duodenal Diverticula, Review of the Literature and Report of a Case. WILLIAM C. SHELDON, HAROLD P. LAZAR, JOHN W. RICHARDS, and GEORGE C. HENEGAR. *Am. J. Digest. Dis.*, 1959, 4: 817.

THE AUTHORS present a review of the literature on gastrointestinal hemorrhage from duodenal diverticula and describe a patient in whom massive hemorrhage from a duodenal diverticulum ultimately caused death. Some controversy exists whether the presence of a diverticulum of the duodenum ever may be a cause of major gastrointestinal bleeding. Most symptoms of duodenal diverticula are the result of super-

ficial erosion or ulceration. There is no characteristic syndrome. The incidence of bleeding is difficult to determine since without surgical or postmortem confirmation one cannot be certain that another lesion is not the cause of bleeding.

The authors note that a search of the literature has revealed only 2 adequately documented cases of bleeding from duodenal diverticula. In 1 of these patients a blood-filled duodenal diverticulum was found at the time of surgical exploration. In the other patient an ulcer crater was shown radiologically in a duodenal diverticulum; at operation it was found to be bleeding and was excised.

The authors report the case of a middle-aged man with a history of massive upper intestinal bleeding. The only significant findings by radiologic examination were a duodenal diverticulum and questionable esophageal varices. Continued bleeding from the upper intestinal tract necessitated operative treatment. The distal esophagus, the stomach, and the first portion of the duodenum were normal. A large multilocular duodenal diverticulum was found low on the lesser curvature of the descending duodenum, extending into the pancreatic parenchyma. Within the diverticulum was a small area of ulceration containing an actively bleeding vessel. Suture ligation of the bleeding vessel and a Hofmeister-Billroth II retrocolic gastric resection were performed.

The authors conclude that uncontrollable or recurrent gastrointestinal bleeding in a patient with a roentgenographically demonstrable duodenal diverticulum and no other significant lesion should be considered an indication for exploration.

—Orville F. Grimes, M.D.

Duodenal Ulcers in Children, with Notes on Their Etiology. JOHN O. LAFFERTY. *Radiology*, 1959, 73: 374.

DUODENAL ULCER is being reported with increasing frequency. The author, a roentgenologist, reports 15 positive roentgenographic diagnoses in 62 patients between the ages of 2 and 15 years. Although the cause of the ulcers in general is not known, it is suggested that neurogenic or psychogenic factors are most likely responsible in children. Certain reproducible personality patterns in the child with ulcer have been emphasized by the psychiatrists, patterns described as unsatisfied need for affection, difficulty in being assertive, and resultant passivity.

The characteristic pattern of the adult ulcer patient—pain, food, relief, pain—is not found as commonly in children. Diffuse abdominal pain is more common and therefore the ultimate diagnosis must be established by meticulous roentgenographic study.

Nonsurgical management is generally successful if attention is paid to the psychogenic factors.

—Harold M. Unger, M.D.

Discussion on the Surgical Management of Chronic Duodenal Ulcer. LESTER R. DRAGSTEDT, R. L. HOLT, GEORGE Y. FEGGETTER, HAROLD BURGE, and Others. *Proc. R. Soc. M.*, Lond., 1959, 52: 835.

THE VALUE of complete division of the vagus nerves to the stomach in duodenal ulcer, according to Dragstedt, depends upon the fact that this operation abolishes the nervous phase of gastric secretion, which markedly reduces the total output of gastric juice by the stomach. When an excessive secretion of gastric juice occurs, the buffering effect of food, saliva, and regurgitated duodenal secretions is overcome and the corrosive properties of the gastric content approach that of pure gastric juice. The discussant holds that peptic ulcers are usually caused by a hypersecretion of gastric juice; further, that the hypersecretion of gastric juice in duodenal ulcer patients is usually of nervous origin, and that the hypersecretion of gastric juice in gastric ulcer patients is usually of hormonal or humoral origin.

The evidence that duodenal ulcers are usually caused by a hypersecretion of gastric juice of nervous origin may be summarized as follows: (1) Duodenal ulcer patients usually secrete from three to twenty times as much acid in the fasting empty stomach at night as do normal people; (2) if a hypersecretion of acid of this degree is reproduced in experimental animals, typical peptic ulcers regularly appear in the duodenum; (3) complete division of the vagus nerves to the stomach abolishes this fasting hypersecretion, indicating that it is of nervous origin. It is probable that in some way the tensions and strain of modern life induce a secretory hypertonus in the vagus nerves, and in this way the central nervous system plays a role in the disease; (4) as the fasting hypersecretion in duodenal ulcer patients is abolished by vagotomy, the ulcers usually heal and, if an adequate drainage operation has been added so that stasis of food in the antrum does not occur, they remain healed.

Most of the persistent or recurrent duodenal ulcers in the discussant's experience have occurred in patients with incomplete vagotomy or with stasis of food in the antrum from an inadequate drainage procedure. Incomplete vagotomy is usually indicated by a 12-hour nocturnal gastric secretion of more than 20 mEq. of free hydrochloric acid and by a positive secretory response to insulin hypoglycemia. In a few patients persistent or recurrent ulceration associated with marked hypersecretion of gastric juice has been due to a chemical agent released by a special type of islet cell tumor of the pancreas described by Ellison and Zollinger. A gastrojejunal ulcer may form after complete vagotomy if an enteroenterostomy has been added to the drainage procedure. This diverts the alkaline duodenal secretions away from the gastroenterostomy stoma and produces a situation resembling that which obtains in the Mann-Williamson procedure for the production of experimental ulcers in animals. It is now quite apparent that even a complete vagotomy cannot be relied upon to heal or to prevent this type of ulcer in either man or experimental animals.

Holt of Manchester stated that 3 years ago, those who supported vagotomy as the most logical treatment accepted the criticism that the results had not been subjected to a sufficiently long test period. This criticism is no longer valid, and a steadily mounting volume of evidence has shown that vagotomy is as effective as subtotal gastrectomy in curing duodenal ulcer and in protecting the patient from recurrent ulceration. The problem that confronts the surgeon today is not that of curing duodenal ulcer but of

making sure that the patient in the process of being cured is restored as nearly as possible to normal, without finding himself troubled with one or more annoying symptoms which are to be found grouped together under the misleading title of the postgastrectomy syndrome. The term is misleading because the symptoms are common to most gastric operations and certainly to any in which the stomach is anastomosed to the jejunum. To avoid these complications the discussant suggested that the gastric contents should pass into the duodenum rather than the jejunum, and that vagotomy should be combined with what is called "anterior pylorectomy." Encouraging is the very low incidence of minor sequelae Bilious vomiting, which was the most troublesome complication after vagotomy and gastrojejunostomy, has almost disappeared. The cases of diarrhea reported amount to no more than an occasional looseness of the stools.

The discussant is certain that vagotomy is at least equal to subtotal gastrectomy in curing duodenal ulcer and preventing subsequent ulceration and that, combined with an anterior pylorectomy, it provides a very low incidence of subsequent symptoms.

Another discussant, Feggetter of Newcastle upon Tyne, believes that vagotomy and posterior gastroenterostomy is the best treatment for all chronic duodenal ulcers requiring surgery. The operation is a safe one; it is no more difficult but may at times be more tedious than a gastrectomy. It is completely successful in a high proportion of patients, enabling them to enjoy normal meals without discomfort and without other unpleasant sequelae of gastrectomy. If the operation is unsuccessful, perhaps due to incomplete vagotomy or some mechanical cause, a partial gastrectomy may then be performed.

Burge of London presented his 10 year results of vagal nerve section for chronic duodenal ulceration. No case has been followed up for less than 9 years and the majority for 10 to 12. From these data, it will be seen that even with an incomplete nerve section rate of probably 30 per cent, the proved recurrence rate at 10 years in both series is about the same.

It may be concluded that, given complete nerve section, the recurrence rate is very low. It is interesting to find that a properly performed vagotomy carries a lower recurrence rate than subtotal gastrectomy, the incidence of gastric ulceration at 10 years being 0.7 per cent in vagotomy and gastroenterostomy, but 2.3 per cent in vagotomy and pyloroplasty. Four and seven-tenths per cent of patients in the pyloroplasty series came later to operation for stenosis, usually more than 5 years postoperatively. It was in these cases that gastric ulceration seemed to occur. Such stenosis appears to have arisen from the faulty choice of pyloroplasty in the presence of duodenal stenosis or from the operation of pyloroplasty alone. The only disturbing feature of the operation of vagotomy with gastric drainage has been the incidence of diarrhea with pale fatty stools. This result led the discussant to compare the incidence of diarrhea in cases of complete vagal nerve section with that after selective vagotomy preserving the celiac division of the posterior nerve. From his studies, he has concluded that preservation of this nerve is essential.

Further, if the 10 year figures are true, and clearly they are; if incomplete nerve section need never occur, and it need not; and if postvagotomy diarrhea can be prevented, and the discussant thinks that it can, then no case can be made out for subtotal gastrectomy for chronic duodenal ulceration.

To Falconer, of Edinburgh, it is comforting to know that the acid reduction obtained by vagotomy and gastroenterostomy is comparable with that achieved by gastrectomy and that the angry, inflamed duodenum or the chronic penetrating ulcer need no longer be a challenge to the intrepid surgeon. A vagotomy and gastroenterostomy will do all that the gastrectomy would have done, without the risks associated with a difficult duodenal dissection. Should a jejunal ulcer appear later and a gastrectomy be required, the duodenum would be found to be quiescent and the operation relatively straightforward.

Welbourn, of Belfast, drew attention to a type of peptic ulceration in which conventional gastric surgery is often useless—the Zollinger-Ellison syndrome already mentioned by Dragstedt. This consists of (1) a fulminating peptic ulcer diathesis; (2) gross gastric hypersecretion—2 to 6 liters of highly acid juice in 12 hours; and (3) a tumor or tumors of the pancreatic islet cells which do not secrete insulin. The syndrome is rare, but since it was described, 4 years ago, many examples of it have been recognized. It seems reasonable, to perform a subtotal gastrectomy and vagotomy, instead of a total resection, only if it is reasonably certain that all of the tumor tissue has been removed. —*Benjamin Goldman, M.D.*

Leiomyosarcoma of the Duodenum, Case Report and Summary of Literature. R. RANDOLPH BRADHAM. *Am. Surgeon*, 1959, 25: 950.

THE AUTHOR summarizes the literature pertaining to 53 cases of leiomyosarcoma of the duodenum and presents brief accounts of case 28 and cases 30 through 53. He then presents in detail case 54, which was seen at the Medical College of South Carolina.

Apparently these tumors arise from the muscular layer and generally grow outward, although usually there is some encroachment on the lumen. Opinions disagree as to whether these tumors are malignant from the start or arise as benign leiomyomas. Their size varies and many undergo central necrosis and fistulization which leads eventually to hemorrhage, abscess formation, or perforation.

In the cases reported to date, sex distribution is equal, and the age incidence peaks slightly in the fifth decade. Duration of symptoms has varied from a few days to 13 years. The most common symptoms were weakness and ease of fatigability. Marked gastrointestinal hemorrhage manifested by hematemesis and melena was present in 50 per cent of the cases.

Roentgenograms were helpful in making the diagnosis, as intraluminal tumors showed a filling defect whereas extraluminal tumors showed pressure defects and interruption of peristalsis. Ulceration was seen in either type.

Treatment consisted of excision of the tumor. Results of treatment have been poor, probably because of the difficulties of wide resection in this location.

—*Stephen W. Carveth, M.D.*

Ileocecal Hemorrhage. DUNCAN SHEPARD. *J. M. Ass. Georgia*, 1959, 48: 503.

THIS IS the first series of cases of major gastrointestinal hemorrhage due to ileocecal prolapse reported in the literature.

Three cases of prolapse of the ileal mucosa through the ileocecal valve are reported. It is pointed out that there is still some controversy about the anatomy of the ileocecal valve because of the variations in the normal valve and the difference between its appearance during life and in the cadaver. There is no agreement on whether an ileocecal sphincter exists or whether competency of the valve is due to the two lips being pushed together by intracecal pressure. The benign and malignant lesions inherent to the colon are found in the ileocecal valve as well as inflammatory changes the cause of which is difficult to determine. Edema of the valve may be idiopathic or secondary to prolapse of the ileal mucosa or to intermittent relenting intussusception.

Strombeck first pointed out the association of edema of the valve with regional enteritis and this was later confirmed by Golden and others. True lipoma of the ileocecal valve has been described as well as lipomatous infiltration which is also called lipomatous hypertrophy of the valve. Although these conditions do not produce symptoms as a rule, they have a characteristic roentgenographic appearance, consisting of a radiolucent shadow which is sharply demarcated from the surrounding tissues; this is especially true of lipoma of the valve. Other benign tumors of the ileocecal valve have been reported.

Although ileocecal prolapse is relatively uncommon, it has been reported fairly frequently in the past few years. Diagnostic laparotomy is indicated whenever there is a cecal defect which is atypical or when the defect is accompanied by blood in the stool, anemia, or a palpable mass. In 1 of the 3 cases of ileocecal prolapse there was lipomatous infiltration of the ileocecal valve. In all cases there was hemorrhage of the prolapsed mucosa with destruction of the epithelium and hemorrhage into the submucosa and muscularis. All of the patients had exsanguinating melena. The cecum, lower ileum, and upper colon were resected and ileocolostomy performed. Convalescence was uneventful and all of the patients were without symptoms or anemia when seen a number of months afterward. The lower abdominal pain present before the operations did not recur. Prolapse of ileal mucosa must be considered as a possible cause of melena, at times of life-endangering magnitude; the bleeding is often painless but may be preceded by intermittent, crampy, lower abdominal pain.

—Miriam Miller, M.D.

Is Ileostomy Always Necessary in the Surgical Treatment of Segmental Ulcerative Colitis? LEROY H. STAHLGREN and L. K. FERGUSON. *Surgery*, 1959, 46: 847.

THE AUTHORS contend that the surgical management of ulcerative colitis does not always require a total colectomy and ileostomy. In support of this thesis, they have reviewed their experience with 136 patients who were operated upon between the years 1939 and 1959 at the Hospital of the Graduate School of Medicine of the University of Pennsylvania, the Women's Medical College, and the Philadelphia General Hospital in Philadelphia, Pennsylvania. Of this group of patients, 88 with diffuse ulcerative colitis were treated by permanent ileostomy and colectomy, a procedure which is considered to be highly acceptable when the disease is not localized. However, in those patients in whom the disease is confined to a specific area of the colon, ileostomy can be avoided in many instances by resecting the diseased area and either restoring continuity of the colon by end-to-end anastomosis when the left half of the colon is free of disease or by a proximal colostomy when the right half of the colon has been spared.

A partial colectomy and primary anastomosis or bypass and later colectomy was performed in 22 patients of whom 19 were followed up. The disease was successfully eradicated in 17.

In 19 patients whose disease was confined to the left half of the colon, a colostomy was performed proximal to the diseased bowel, which was resected primarily in most instances. In 6 of 18 patients followed up in this group, the colostomy halted progression of the disease for an average of 10 years and as long as 22 years. The period of delay between the time the colostomy is performed and further surgery is required may be significantly long even in the failures (average 4 years).

In a small group of patients (7), the rectum was free of disease or there was disease of minimal significance, and a delayed anastomosis with takedown of the ileostomy was performed. Three of these 7 patients remain asymptomatic. Moderate or severe rectal involvement rarely improves sufficiently to permit reanastomosis. *—Harvey N. Lippman, M.D.*

A New Emphasis in Management of Carcinoma of the Right Colon in the Very Old, Review of 67 Patients 70 to 92 Years of Age. WILLIAM H. SNYDER, JR., and E. M. GREANEY. *Ann. Surg.*, 1959, 150: 872.

THE AUTHORS undertook a study of patients 70 or more years old at the Los Angeles County General Hospital, Los Angeles, California who had carcinoma of the right colon. The authors wished to determine what effect age has on the symptomatology, findings, recognition, management, and prognosis. Sixty-seven such patients between the ages of 70 and 92 form the basis of this study which covers a 5 year period from June 1951 to July 1956. Females outnumbered males almost 2 to 1. The patients were followed up either until death or over a 5.5 year period.

The average duration of symptoms was 6.1 months. Oftentimes the early symptoms of the disease were discredited by the patients and were thought to be due to the effects of advancing years. Fifty-three of the 67 patients, 79 per cent, were operated upon and resections were carried out in 77 per cent of these patients.

The advanced nature of the malignant lesion was indicated by the pathologic findings which revealed hepatic or peritoneal metastases in 15 per cent of the operative cases, metastatic lymph node involvement in 50 per cent of all resections, and a second unrelated malignant lesion proved in 13 per cent.

—Orville F. Grimes, M.D.

Present Status of Surgery of the Colon and Small Bowel. FRANK GLENN and BJORN THORBJARNARSON. *N. York State J. M.*, 1959, 59: 3988.

THE AUTHORS present a concise review of the major diseases of the colon and small intestine. In the first category, Imperforate Anus and congenital megacolon are briefly reviewed and the problem of correction by staged procedures is outlined.

While the chronic nature of ulcerative colitis is emphasized, it is clearly pointed out that the course of this disease may be interrupted by an acute perforation which requires urgent surgical attention. Massive bleeding and carcinoma may complicate the disease as well. Surgical management involves total colectomy and ileostomy in one or two stages.

Diverticulosis of the colon increases in incidence with age. Surgery may become advisable or imperative in the management of the complications: bleeding, perforation, obstruction, and the formation of fistulas. Approximately 80 per cent of all diverticula are located in the sigmoid colon. At the present time, the surgical opinion as to management is divided between staged procedures and one-stage operations with primary anastomosis. The type of procedure is dependent upon the pathologic process present. The disease is often difficult to differentiate from carcinoma of the colon.

The incidence of carcinoma of the colon is highest in the rectal segment and decreases as one moves proximally toward the cecum. Seventy per cent of the malignant tumors of the colon and rectum may be seen and felt by sigmoidoscopic and digital examination. The operations for cancer of the colon and rectum aim at the wide removal of the lesion along with the arterial and venous blood supply and lymphatics. For lesions above the peritoneal reflection there would seem to be general agreement in the employment of anterior resection and primary end-to-end anastomosis. When the lesion is at the peritoneal reflection or just below it, the weight of opinion favors abdominoperineal resection.

Polyps of the colon may be solitary, multiple, or in the form designated as familial polyposis. The latter is a peculiar form of adenomatosis of the large bowel which is transmitted as a nonsex-linked mendelian dominant. The relationship of carcinoma of the colon and polyps is not clearly defined. It is known, however, that polyps and carcinoma frequently occur in the same area of the bowel and that carcinoma is found about five times more frequently in individuals with polyps than in those without polyps. Familial polyposis is a malignant disease and requires removal of the colon soon after puberty. Polyps seen in childhood are potential sources for bleeding and obstruction but are not related to the problem of carcinoma. Polyps found in adult life are treated in accordance with their location and in relation to the length of their stalk and the nature of the mucosa which makes up the polyp.

Surgery of the small bowel constitutes the second portion of this review. Reference is made to Meckel's diverticula which manifest themselves by bleeding, obstruction, inflammation, or perforation. Between one third and two thirds of the cases are usually considered to be symptomatic.

Malignant tumors of the small bowel though not common are fully reviewed. They are usually classified into carcinomas, leiomyosarcomas, lymphosarcomas, and carcinoid tumors. Symptoms are manifested by obstruction, perforation, or anemia from chronic bleeding. Carcinoid tumors may be associated with an internal secretion known as serotonin which causes peculiar flushing of the skin, tachycardia, and hyperperistalsis. A functioning carcinoid tumor is demonstrated by the presence of abnormal quantities of indolacetic acid in the urine.

Regional ileitis is described as a nonspecific granulomatous disease of the small intestine equally distributed between men and women from 10 to 77 years of age, with an average of 24 years. The indications for operation for regional enteritis include hemorrhage, obstruction, perforation, the formation of fistula, and the presence of a mass. Opinion on surgical treatment is divided between those who would resect primarily and those who would short-circuit the involved segment of bowel. Recurrence of the disease is common.

The direct surgical attack on the mesenteric vessels has improved the outlook for mesenteric thrombosis which ordinarily resulted in death in approximately 80 per cent of patients. The diagnosis of mesenteric thrombosis is usually made preoperatively only if it is suspected in an individual who presents the etiologic factors which may be responsible for this disorder. Surgical therapy in the past was limited to excision of gangrenous portions of the bowel but today vessels are explored and embolectomy or endarterectomy, as indicated, is carried out.

A discussion of the surgical aspects of intestinal obstruction concludes this review and it is pointed out that a gradual improvement has occurred in all phases of diagnosis and management of this problem. The small bowel is the most frequent site of obstruction and adhesions are the most common cause, although external hernia is a close contender. The improvement in the management is related to earlier diagnosis and treatment, proper correction of electrolyte and fluid imbalance, decompression of the intestinal tract, the judicious use of antibiotics, special attention to associated diseases, and earlier surgical intervention. —*Harvey N. Lippman, M.D.*

Duplication of the Sigmoid Colon. MARVIN ROBERTS, JACOB RABINOVITCH, MAXWELL FELTON, and ROBERT LERNER. *Ann. Surg.*, 1959, 150: 904.

DUPLICATION of the alimentary tract has been generally recognized as a definite pathologic entity presenting consistent anatomic features regardless of the site of development of the anomaly. The condition is by no means common but it is not of such rarity that any surgeon who deals regularly with abdominal surgery can afford to ignore its existence. From the clinical point of view, the most interesting problem is diagnosis, and brief acquaintance quickly teaches one the ease with which the nature of the disease may be missed. In the great majority of cases duplication of the bowel is not diagnosed clinically but only after roentgenologic examination or exploratory laparotomy. The nature of the lesion is often missed then, unless the possibility of the anomaly is borne in mind.

Since these lesions are so uncommon, no one surgical center can offer a series susceptible to statistical analysis. There is general agreement that the treatment is surgical. Simple enucleation of the lesion may be undertaken when the duplication has a separate mesentery. Most duplications, however, share the same blood supply with the adjacent intestine. In such instances, resection of both the duplication and contiguous bowel becomes necessary. It may become expedient to anastomose the duplication to the alimentary canal in order to avoid resection of an unduly large segment of bowel. Lastly, cases have been reported in which marsupialization of the duplication was done. The authors do not advocate such a procedure and believe that it should be discouraged. Resection of the duplication together with the contiguous segment of bowel is the treatment of choice and should be carried out whenever possible.

—Benjamin Goldman, M.D.

Anorectal Melanoma (Il melanoma anorettale). E. Percesepe and F. Claudio. *Riforma med.*, 1959, 73: 1194.

The authors report 3 cases of anorectal melanoma observed in the Surgical Department of Institute for the Study and Treatment of Tumors in Naples, Italy. The first part of the article is devoted to an extensive review of the literature on the subject as well as to a detailed description of the pathogenesis, pathologic changes, symptoms, diagnosis, prognosis, and treatment of this type of cancer. Because of the paucity of their series, the authors cannot contribute to the statistical knowledge of the disease; however, their 3 cases are well presented and thoroughly described. In 2 of their 3 patients the disease was diagnosed early. Only 1 patient, however, had early radical surgical treatment. The survival rate was from 8 to 27 months. In all 3 cases the melanoma was located at the anus, and in 1 early metastasis was present.

The authors conclude that an anorectal melanoma is a highly malignant tumor characterized by early invasiveness. Surgery, therefore, is indicated whenever the suspicion of the presence of this type of tumor exists.

—Maria Serratto, M.D.

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

A New Flocculation Test for Differentiating Obstructive from Hepatocellular Jaundice. George K. Daikos, Pericles Mattheou, and Maria Athanasiadou. *Lancet*, Lond., 1959, 2: 488.

Since none of the currently performed laboratory tests for the differentiation of obstructive and hepatocellular jaundice is entirely satisfactory, this evaluation of a new flocculation test is of considerable interest. In 1957, Jirgl, working on the determination of blood mucoproteins, found that the serum of patients with obstructive jaundice became turbid and formed a precipitate with the addition of Folin-Ciocalteau's phenol reagent. This study evaluates the test in 90 patients, 25 of whom had obstructive jaundice. In 23 of these patients the result of the test was positive. One of the 2 false negative results occurred in a blood sample withdrawn 18 days after choledocholithotomy from a patient with mild persistent bilirubinemia. In 12 of this group the results were positive due to liver neoplasm.

Of 29 patients with hepatocellular jaundice the result was positive in only 3. In 2 cases each of infectious hepatitis and homologous serum jaundice, the test was performed during the acute phase when the stools were pale and the results were negative in each instance. The test was performed in 36 other patients, 8 with hemolytic jaundice, and the remainder having other diseases or being normal controls. Two false positive reactions occurred in this group, both in patients undergoing treatment with antimony preparations for leishmaniasis.

Preliminary studies suggest that the precipitate is not a mucoprotein. The test itself has no relationship to the serum bilirubin level or to any of the routine liver-function turbidity tests. In patients with long-standing obstructive jaundice with abnormal liver-function tests, the result of this test was negative. The correlation of this test with the clinical status of more than 90 per cent of the patients tested, along with the ease of its performance, recommends it to aid in the differentiation of obstructive and hepatocellular jaundice.

—Stuart L. Scheiner, M.D.

Differential Diagnosis of Jaundice, a Statistical Study of 926 Cases. Carl H. Greene. *J. Am. M. Ass.*, 1959, 171: 1780.

At the New York University Hospital, New York, New York 926 patients with jaundice due to diseases of the liver or biliary tract were reviewed. In 87 per cent of the cases the diagnosis was confirmed at operation or by pathologic examination. Jaundice was due to the following causes in 306 males: hepatitis, 18 per cent; cirrhosis, 11 per cent; cholecystitis, with or without stones, 47 per cent; carcinoma, 22 per cent; and miscellaneous, 2 per cent. Amongst 620 females the causes of jaundice were: hepatitis, 4 per cent; cirrhosis, 2.5 per cent; cholecystitis, with or without stones, 82 per cent; carcinoma, 9 per cent; and miscellaneous, 2.5 per cent.

The author found that in patients under the age of 20 years, 85 to 87 per cent of the cases of jaundice are due to hepatitis and so should be treated medically. After the age of 30, about 80 per cent of the cases of jaundice in men and 95 per cent in women are due to surgical conditions. Therefore, if a definite diagnosis cannot be made within a reasonable time—within 2 to 4 weeks of jaundice at the longest—the patient should be given the benefit of the statistical doubt and should be referred for operation.

—Gilbert S. Campbell, M.D.

Observations on Human Bile Secretion, Report of a New Method of Continuous Recording of the Total Bile Secretion (Beobachtungen der Gallesekretion des Menschen, Mitteilung einer neuen Methode zur fortlaufenden Registrierung der gesamten Galleausscheidung). Günter Mollowitz. *Langenbecks Arch. klin. Chir.*, 1959, 291: 359.

The author has developed a special common duct tube which permits (1) observation of all the bile produced by the liver, (2) avoidance of disturbance of liver function since the collected bile is returned to the

upper small intestine, and (3) a continuous automatic curve on a graph of all the bile produced over a 2 week period.

Since a T tube allows the escape of some bile into the duodenum, it is not possible to get exact determinations of the bile flow. To overcome this, the distal end of the tube was blocked with a plug of foam rubber which was fastened to the tube. A plastic capillary tube was passed through the ampulla of Vater deep into the duodenum and brought out through the common duct opening with the T tube. Through this plastic tube fluids, including the collected bile, can be infused into the duodenum at any time.

The continuous recording of the bile flow was accomplished with a pluviometer. One hundred patients were studied. In 30 of them only the T tube was used, and in 70 the transcholedochal tube was added. In 25 of these 70 patients the foam rubber block was added, and the continuous graph was obtained by means of the pluviometer in 10.

Daily measurements of bile secretion were made in 1,000 patients. Bile production was low immediately after operation and gradually increased to an average total of 500 to 600 c.c. daily by the eighth to the ninth day. Reinfusion of the bile is important to avoid electrolyte imbalance.

That bile is secreted continuously by the human liver, even during sleep, was demonstrated by 126 daily curves obtained over a period of 12 to 14 days.

Immediately after operation the amount of bile secreted during the day was almost the same as that secreted during the night. During the first postoperative days, the ratio of day to night secretion progressively increased and remained at 2 to 1. There were some patients with no specific rhythm regarding day and night secretion.

Food ingestion generally increases bile production. It was noted that after big meals the effect lasted from 11 to 13 hours. Fasting had little effect. Choleretic agents did not influence bile production. Neither enteral nor parenteral fluid increases had any effect on the production of bile. —*Max L. Smith, M.D.*

The Management of Overlooked and Recurrent Stones in the Bile Duct, with Special Reference to Transduodenal Choledochal Sphincterotomy. Rodney Maingot. *Austral. N. Zealand J. Surg.*, 1959, 29: 66.

The incidence of overlooked and recurrent stones in the bile duct is approximately 2 to 3 per cent after cholecystectomy alone, 8 to 12 per cent after cholecystectomy and common duct exploration, and about 10 per cent for reformation after secondary common duct exploration. Accurate exploration of the common duct is the key to the prevention of this complication. The operative cholangiogram is utilized as an aid.

The author believes that sphincterotomy is indicated in cases in which (1) stones recur after previous surgery; (2) a sound cannot be made to enter the duodenum; (3) difficulty is encountered passing the Bake dilators up to the 5 mm. size; (4) a stone in the duct can be felt but cannot be removed from the duct itself; (5) there are many stones and associated pancreatitis; (6) the stones are impacted at the ampulla; in (7) most cases of repeated pancreatitis; (8) the majority of cases of complications of pancreatitis; and (9) in fibrosis of the sphincter of Oddi.

There are a carefully made outline and excellent drawings of the author's technique for exploration of the common duct and for sphincterotomy. The author believes that any attempts at biliary flush are futile and dangerous and that when recurrent stones are found re-exploration is indicated.

—*Harold M. Unger, M.D.*

Timing in Surgery of the Biliary Tract. William W. Mattson, Jr. *Northwest M.*, 1959, 58: 1549.

A series of 30 cases of biliary tract disease treated surgically is considered. Nine cases are classified as acute with a history of 3 to 4 days; 8 as subacute with a history of 2 to 3 weeks and often some edema around the biliary tract; and 13 as chronic with acute symptoms or inflammatory changes.

Patients with the acute cases were in an older age group. In these cases there was typically a rise in temperature and an increased white blood cell count. There was evidence of acute inflammation on histopathologic examination. In 1 case a common duct stone present at operation could not be demonstrated roentgenologically later. The operative procedure was cholecystectomy. One patient had choledochotomy. There were no deaths.

In the subacute and chronic groups were cases of repeated attacks and those which had been allowed to quiesce. In the subacute group there were 2 deaths. Both patients were in the sixth decade and had long histories of many attacks of cholecystitis and of cardiac disease. It is pointed out that the combination of long-standing biliary tract and cardiac disease is a bad one.

In the chronic group there was 1 death in a patient who, however, was not a surgical case. The patients in this group averaged 8 years younger than in the others. Members of this group evidenced more complications, longer convalescence, and poorer final outcome.

Although hasty surgery is not advocated, it is pointed out that, in this series, better final results were obtained in those patients operated upon in the early acute stage. A few months of observation of a residual common duct stone frequently demonstrated its spontaneous disappearance and another operation was avoided. The stress of continued attacks of cholecystitis with prolonged convalescence adds up to greater insult to the patient and to the greater frequency of occurrence of coronary heart disease. The importance of proper timing of surgical intervention is stressed. —*Miriam Miller, M.D.*

Acute Pancreatitis as a Postoperative Complication in Biliary Surgery (La pancreatitis aguda como complicación postoperatoria en cirugía biliar). Wolfgang G. Lange. *Bol. Soc. cir. B. Aires*, 1959, 43: 712.

The case reports and autopsy findings of 2 patients with acute pancreatitis are presented from a total of 63 patients who had biliary tract operation during the past 2 years at a South American institute of clinical surgery.

The first patient was a 48 year old woman who had had a cholecystostomy. In the subsequent 3 months

eight episodes of pain occurred in the right hypochondrium, radiating to the epigastrium and accompanied by nausea, vomiting, and transitory hypocholia.

Transpapillar drainage was applied. After 24 hours of a normal postoperative course, manifestations of shock developed suddenly and, despite treatment, the patient died 4 hours later. The autopsy disclosed acute necrotic pancreatitis.

The second patient was a 59 year old woman who 23 years previously had had an operation for a syndrome of cholecystic lithiasis. The gallbladder was removed and the choledochus was drained. After the operation the patient remained well for 19 years, then began again to suffer from episodes of hepatic colic.

At reintervention a transduodenal papillotomy was carried out, a wedge of tissue was resected, and the duodenal and choledocal mucosae were approximated by interrupted sutures. Twenty-four hours after this operation anuria developed and hematomas appeared in the operative wound and on the buttocks. There was abundant sanguineous drainage through the counterincisions; nevertheless, uncontrollable symptoms of shock appeared and the patient died 48 hours after the intervention. The autopsy disclosed acute hemorrhagic pancreatitis.

In the author's experience, these grave episodes of acute pancreatitis are rather rare in cases involving biliary surgery and tend to occur in connection with operations on the lower portion of the main bile duct and on the papilla, particularly when associated with transpapillar drainage with the T drain. Thus, the author himself and the discussants of his report seem to be unanimous in the belief that the transpapillar drainage tube should be abolished in this type of operation and that extreme care should be exercised by the surgeon when he is operating in the region of the duodenal papilla. —*John W. Brennan, M.D.*

Carcinoid of Ampulla of Vater. JOHN M. MCRAE and J. HAROLD CONN. *Surgery*, 1959, 46: 902.

ONLY 28 authenticated cases of primary carcinoid tumors of the duodenum have been reported. Carcinoid involving the ampulla of Vater has been reported only three times. Two additional cases of carcinoid involving the ampulla of Vater are reported.

Both patients gave a long history of intermittent jaundice. Both tumors were widely resected by a transduodenal approach, and the common duct was reimplanted in the duodenum. The patients have survived 5.5 years and 1 year, respectively, after surgery without evidence of recurrent tumor.

—*Harvey W. Baker, M.D.*

Treatment of Pancreatitis and Disease of the Biliary Tract by Cholecystectomy and Drainage of the Common Duct (La pancréatite d'accompagnement dans les affections des voies biliaires). J. CAHEN. *Acta gastroenter. belg.*, 1959, 22: 443.

THE AUTHOR has observed the frequent association between disease of the biliary tract and involvement of the head of the pancreas, by virtue of voluminous lymph nodes at the terminus of the cystic duct and/or the retroduodenal portion of the common duct, and at times a lymphangitic pericholedochitis. Postoperative pancreatitis, he believes, is a secondary acute lymphangitis. Drainage of the common duct is curative and sphincterotomy is unnecessary except when the sphincter of Oddi is sclerotic or cannot be dilated due to other cause. Simple drainage of the common duct is followed by smooth, uneventful recovery.

Fifty-one cases of clinical pancreatitis were encountered in 360 interventions for disease of the biliary tract. Seven of these 51 cases are reported in detail, together with 34 reproductions of operative and postoperative cholangiograms. These pancreatitides represent lymphangitic involvement. All patients but 2 had uneventful recovery after simple drainage of the common duct without sphincterotomy or plastic surgery of the sphincter of Oddi. The author does not think manometric pressure studies at the time of operation help in establishing the need for sphincterotomy; free flow of bile into the duodenum as demonstrated by cholangiography is the best guide.

—*Edwin J. Pulaski, M.D.*

Results of Subtotal Pancreatectomy in the Treatment of Carcinoma of the Pancreas. HAROLD A. ZINTEL, JONATHAN E. RHOADS, and JOHN HELWIG, JR. *West. J. Surg.*, 1959, 67: 293.

THE AUTHORS present their experiences with 83 patients with an operative diagnosis of carcinoma of the region of the head of the pancreas who were operated upon from August 1941 to May 1952 at the Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania. Twenty-one of these patients were subjected to radical resection of the head of the pancreas, and biliary shunts of one type or another without removal of the tumor were performed on 50 of the patients. The average length of survival of the 24 patients with proved carcinoma who were subjected to biliary shunt was 9 months. Of the 21 patients subjected to the Whipple type of resection, 6 have survived for 5 to 11 years. There were 4 operative deaths in 21 patients or 19 per cent. Thus, the 5 to 10 year survival rate after the Whipple resection was 29 per cent of all patients subjected to the operation, or 35 per cent of all patients surviving the operation.

The early signs and symptoms of the disease in order of their incidence were pain, anorexia, weakness, and gastrointestinal disturbances. The immediate preoperative signs and symptoms in order of their incidence were (1) jaundice, intermittent in 33 per cent, (2) pain, (3) anorexia, (4) gastrointestinal disturbances, (5) marked weakness, and (6) palpable gallbladder in 27 per cent.

In all but the first 4 patients subjected to Whipple's resection the remaining portion of the pancreas was anastomosed to the jejunum or the stump of the duodenum. In the majority of the patients the gastrojejunal anastomosis was made distal to the common bile duct and pancreatic anastomoses in order to decrease the possibility of acid digestive juices affecting the latter anastomotic sites or producing jejunal ulceration. In 10 patients the reconstructive procedure was a proximal end-to-end choledochoduodenostomy, an intermediate end-to-side pancreaticojejunostomy and a distal gastrojejunostomy to the cut end of the stomach. The histologic diagnosis of carcinoma was available to the surgeon in only 9 of the 21 patients

or 42 per cent at the time the head of the pancreas was removed. The difficulty in obtaining a wedge biopsy of the head of the pancreas with a scalpel is well recognized because of the small size of most of the resectable tumors and the vascularity of the pancreas. Many patients also have a localized low grade pancreatitis around the tumor and this also leads to confusion of the surgeon and the pathologist. Duodenotomy, sphincterotomy, and the use of the Vim-Silverman needle are very helpful in attempting to obtain an adequate biopsy specimen.

In the majority of the patients, in the absence of a positive histologic diagnosis, a pancreaticoduodenectomy was performed if the head of the pancreas contained a palpable tumor, if there were evidences of common duct and/or pancreatic duct obstruction, and if calculi were not present.

—*James H. Holman, M.D.*

MISCELLANEOUS

Emergency Reoperation in Abdominal Surgery. A. G. R. Lowdon. *J. R. Coll. Surgeons Edinburgh*, 1959, 4: 291.

The author reviews a group of patients who underwent emergency reoperation of the abdomen during their postoperative course on his unit at the University of Durham, Newcastle-upon-Tyne, England, from 1955 to 1957. In the 3 year period, just over 1,500 abdominal operations were performed on a slightly smaller number of patients. Emergency reoperations were performed on 62 of these patients. Some patients had more than one re-exploration, resulting in a total of 75 re-explorations. This represents about 4 per cent of the patients operated upon.

The diagnosis of the early postoperative complications of abdominal operations is notoriously difficult. Peritonitis may develop without notable pain, rigidity, or tenderness; the differentiation between mechanical and paralytic intestinal obstruction is unusually difficult; and early postoperative bleeding may be disguised because so many other factors are present that might account for the development of a shocklike state.

The over-all mortality rate for the group was 5.3 per cent. There were 20 deaths among the 62 patients undergoing emergency reoperation, a case mortality of 32 per cent. Of the 81 patients who died after abdominal surgery 20, or about 1 in 4, had reoperation.

Eleven patients had a total of 13 reoperations because of residual intraperitoneal abscess; there was 1 death in the group.

Nine patients had re-exploration because of bleeding; 1 of these died. Four of the postoperative hemorrhages were intragastric. Most of the episodes of postoperative bleeding were due to errors in technique.

Nineteen patients had re-explorations because of mechanical intestinal obstruction; 6 of these patients died. Less than half of the cases in this group were due to adhesions. Three cases of pyloric obstruction were caused by chronic duodenal ulcer, 2 after closure of a perforation. The author believes that severe pain in the back after a Polya gastrectomy should make the surgeon think of duodenal dilatation, which may be caused by afferent loop obstruction and may herald breakdown of the duodenal stump.

There were 11 patients with leaks or perforations who had a total of 13 reoperations; 5 patients died. There were 4 patients with leaks from the duodenal stump and 2 of them died. In 5 patients the leaks were at anastomoses after resection of the bowel.

There were 3 patients with paralytic ileus who had explorations. These 3 patients all had drumlike abdominal distention sufficient to cause respiratory and even circulatory embarrassment.

Wound disruption occurred in approximately 1 per cent of all abdominal operations. Patients with simple skin separation or with breakdown of the superficial part of the wound because of sepsis were treated nonoperatively and were not included. In the 13 patients the dehiscence started in the deeper layers and the skin separation varied from a small opening which revealed the underlying dehiscence to a sudden and complete "burst abdomen." There were 6 deaths in this group, but the author believes that only 3 of the deaths were in any way attributable to the actual dehiscence.

—*Bernard C. Gerber, M.D.*

GYNECOLOGY

UTERUS

Cervical Cancer, a Résumé of Carcinoma of the Uterine Cervix at the University of Wisconsin Hospitals 1936-1950. WILLIAM KIEKHOFER, RUSSELL F. LEWIS, THOMAS J. RICE, and RALPH E. CAMPBELL. *Obst. Gyn.*, 1959, 14: 559.

SEVEN HUNDRED AND THREE cases of cervical cancer were seen at the University of Wisconsin Hospitals, Madison, Wisconsin from 1936 to 1950, and 98.4 per cent of the patients were followed up for more than 10 years. The data obtained from these patients is the subject of this report.

The 567 patients with invasive cervical cancer received primary therapy, invariably irradiation, at the reporting institution. These lesions were advanced, in 55 per cent being in stages III and IV. The over-all uncorrected 5 and 10 year survival rates were, respectively, 34 per cent and 23 per cent.

Of those patients who died of the disease, 68 per cent did so within 2 years and 83 per cent within 3 years. Nevertheless, even a 10 year survival may not be a cure, since 4 patients free of the disease at this time subsequently died of metastases.

Cervical cancer was diagnosed during pregnancy or the early puerperium in 20 patients, and 80 per cent of these were advanced lesions. The over-all 5 year survival in this group was only 25 per cent.

Cancer occurred in the retained cervical stump in 60 patients.

Twenty-seven per cent of all patients were less than 40 years of age, and 39 patients were less than 30 years of age. Survival among the latter patients was the same as for the entire series.

Significant complications of radiation therapy occurred in 35 per cent of cases, frequently multiple in nature. —*M. Leon Tancer, M.D.*

Supplementary Treatment of Radiation-Resistant Carcinoma of the Cervix with Estrogenic Hormones (Zusaetzliche Behandlung des strahlenresistenten Collumcarcinoms mit oestrogenen Hormonen). H. RUNGE, H. ZEITZ, and W. LINDENSCHMIDT. *Arch. Geschwulstforsch.*, 1959, 15: 70.

TUMORS ARE DESIGNATED as radioresistant when they do not respond to the usual radiation dosage and continue to grow, uninfluenced by radiation therapy. This is purely a clinical concept; however, both histologic and cytologic methods have been utilized to predict whether a favorable radiation response will occur. A favorable response is not definite on clinical grounds until 3 or 4 months after the conclusion of radiotherapy.

The current methods for the management of radioresistant carcinoma of the uterine cervix consist of radical surgical procedures including evisceration, electrocoagulation, repeated radiotherapy with higher dosage, and the intracavitary administration of radium combined with radiogold in the parametrium.

The authors report on the use of preoperative and postoperative estrogen in cases in which radiotherapy has failed. The hormone decreases the technical difficulty of the operation by increasing tissue succulence. No effect on wound healing has been noted. It is not believed that estrogen incites a spreading of the cancer.

TABLE I.—SUMMARY OF RESULTS IN 24 PATIENTS

Stage	*No. of patients*	*5 Yr. salvage*
I	9	6
II	14	8
III	1	1
Total	24	15 (62.5% ± 9.3)

A summary of 49 cases of patients with radioresistant carcinoma of the cervix treated from 1936 to 1948 at the Women's Clinic in Heidelberg, Germany, shows that there were no 5 year survivals. Of the 9 patients with stage I cancer, 2 had a Wertheim-Schauta operation and 7 electrocoagulation and high-dosage roentgen therapy. Of 40 patients with stage II carcinoma, 1 had a Wertheim-Schauta operation and 39 electrocoagulation and high-dosage roentgen therapy.

The use of large doses of estrogen as supplementary therapy increased the salvage rate in 24 patients who were treated from 1949 to 1953 (Table I).

—*Warren R. Lang, M.D.*

EXTERNAL GENITALIA

Radical Vulvectomy with Bilateral Inguinal, Femoral, and Iliac Node Resection. HOWARD ULFELDER. *Am. J. Obst.*, 1959, 78: 1074.

THIS ARTICLE summarizes briefly the literature and historic evidence to support the belief that cancer of the vulva can be cured surgically in a high percentage of cases if an initial radical attack is carried out. The operation involves removal of the entire vulva and both the superficial and deep nodes in the groins bilaterally.

The author then analyzes a series of 53 patients in whom single stage surgical treatment had been carried out. In 23 patients the deep nodes were not removed, but in 4 of these 23 women subsequent deep node dissection was carried out because of the unexpected pathologic finding of metastasis in the superficial groups. The author now believes that deep node dissection should always be planned to be done at the initial operation, since it is generally recognized that the highest cure rates follow in patients treated in this fashion. Moreover, in his analysis it was demonstrated that the morbidity, mortality, length of operating time, and amount of blood replacement was only slightly greater in the 30 patients who had the complete procedure in one stage.

The postoperative morbidity is also analyzed with respect to the healing of the wounds, the incidence of edema of one or both legs, urinary stress incon-

tinence, and postoperative femoral hernia. Only a few of the incisions heal *per primam*, and secondary operations, usually multiple Thiersch grafts, were used on 27 patients. The delay in healing was never a serious complication, because the defect always overlay the symphysis pubis and the femoral vessels were not exposed. The more recent use of suction catheter drainage under these large skin flaps, as described by MacDonald, Smith, Guiss and de Moss, is considered by the author to be an important addition to the management of these cases and to the success of the healing.

The author concludes that the operation described is appropriate for the treatment of cancer of the vulva, in that it may be done in one stage with little hazard even in elderly and poor risk women. The patient must expect to spend 4 to 6 weeks in the hospital, and it may be another month before healing is complete. Unpleasant late deformities and disability are infrequent.

MISCELLANEOUS

Vesical Incontinence in the Female (L'incontinenza vesicale nella donna). G. Pescetto. *Q. clin. ostet. gin.*, 1959, 14: 519.

In the period 1951 to 1958 at the Institute of Clinical Obstetrics and Gynecology of the University of Genoa, Italy, 160 women with vesical incontinence of urine were observed. The cases reported may be divided into age groups as follows: 20 to 30 yrs. (7 cases), 30 to 40 yrs. (15 cases), 40 to 50 yrs. (86 cases), 50 to 60 yrs. (29 cases), 60 to 70 yrs. (18 cases), and more than 70 yrs. (5 cases). Division of the material by number of parities gives the following: nulliparas, 2 cases; para I, 31 cases; para II and III, 83 cases; para IV and V, 41 cases; and more than 5 children, 3 cases. The dystocias in this material were as follows: application of forceps, 20 cases; podalic extractions, 7 cases; macrosomia fetalis, 13 cases; perineal and vaginal lacerations of second and third grades, 10 cases; cesarean sections, 1 case; and prophylactic perineotomies, 3 cases.

Of the total of 160 patients, 25 were given exclusively medical treatment and 135 were treated surgically. The surgical treatment consisted of 42 operations by the method of Pestalozza or Pestalozza-Falk with 37 cures (88 per cent); 5 urethroplasties of Te Linde with 3 cures (60 per cent); 55 cervicocystopexies of Marshall-Marchetti with 44 cures (80 per cent); 7 Millin-Read operations with 5 cures (71.4 per cent); 3 operations by Ball's method with 2 cures (66 per cent); 15 operations using the method of Marshall-Marchetti associated with the suprapubic plication of Ball with 15 cures (100 per cent); 5 Studdiford's operations with 4 cures (80 per cent); and, finally, 3 operations by the abdominovaginal route, consisting of urethrovesicolysis, plication of the vesical neck, and cystopexy by Ball's method with 3 cures (100 per cent).

These uniformly good results were obtained only by lengthy and detailed study of each individual case; by comprehensive urologic examination including urethrocystoscopy, urethrocystography, sphincterocystotonometry, and the trigonal tests; by a careful adaptation, in the individual instance, of the surgical technique to the end to be attained and, finally, great care in the performing of the operation itself.

The patients discussed have been under postoperative observation for an average of 6 months and never longer than 2 years; this, of course, does not take care of all the possibilities of recurrence. A long period of follow-up is desirable.

The most important problem, however, is the diagnostic one, since it is necessary to distinguish between the true vesical incontinence and the forms of pseudoincontinence that result from the presence of anomalies or injuries acquired during the process of childbirth. —*John W. Brennan, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Environmental Hazards of Pregnancy. ALICE M. STEWART. *J. Obst. Gyn. Brit. Empire*, 1959, 66: 739.

THE EFFECTS of work during pregnancy have been studied in 1,318 primiparas, all women who gave birth to a single first child in Northamptonshire, England during 1952. There appears to be a genuine association between premature delivery and work during pregnancy. The findings are in line with those reported by Douglas, who also showed that the association held only for working mothers who lacked domestic assistance in their homes.

Toxemia of pregnancy appears to develop more readily in women who are overweight for their height than in women who are underweight.

The author is still prepared to stand by her original statement that a "typical" roentgenographic examination *in utero* doubles the risk of leukemia and cancer in childhood. The actual risk from any single examination depends on the intensity and the date of the exposure. Roentgenograms taken in the first trimester are more dangerous than those taken in the third trimester, and two exposures are more dangerous than one. —*Charles Baron, M.D.*

The Epileptic in Relation to Pregnancy. HELEN DIMSDALE. *Brit. M. J.*, 1959, 2: 1147.

BECAUSE OF therapeutic management the epileptic woman now has increased opportunities of marriage, and pregnancy in the epileptic is likely to become a more common therapeutic problem. The effect of pregnancy on the epileptic is unpredictable. According to statistics about a third of pregnant women show an increased incidence of fits. In many cases there is no change in the incidence. Occasionally amelioration is seen, most likely a result of better therapy.

Patients with menstrual epilepsy, indicating a sensitivity of the seizure threshold to metabolic changes, tend to have fits in pregnancy that may become more severe. Recurrence of fits in pregnancy may be observed after a long period of complete freedom from epileptic attacks. Epilepsy may develop in a first or later pregnancy, and the attacks tend to be focal in clinical or electroencephalographic manifestations.

Metabolic changes such as hydration, alkalosis, and reduction of serum electrolytes can bring on seizures in the epileptic. These same changes are associated with the pregnant state and predispose to an increase in fits. Studies on pregnant epileptic patients suggest that a rapid increase in weight usually precedes the appearance of more frequent epileptic seizures. Essential hypertension combined with toxemia of pregnancy may precipitate the appearance of epilepsy.

The incidence of status epilepticus is low but its mortality is higher than that of eclampsia. It can be differentiated from eclamptic convulsions by the presence of normal blood pressure and absence of albuminuria and edema. The epileptic woman should not be discouraged from pregnancy unless the attacks are difficult to control in the nonpregnant state. Her prenatal care should be as thorough as in suspected toxemia of pregnancy. In the management of pregnancy the use of anticonvulsants is advocated; excessive gain in weight should be controlled; anemia should be corrected, diuretics such as acetazolamide should be given if water retention is present; and hypotensive drugs for control of hypertension are recommended.

Because pregnancy may cause the appearance of focal signs of a cerebral tumor, investigation of gestational epilepsy to exclude a neoplasm may be indicated. —*Lawrence I. Bernard, M.D.*

Habitual Late Abortion Due to Cervical Insufficiency and Its Operative Management (Ueber habituelle Spaetabortus durch Zervixinsuffizienz und ihre operative Behandlung). RUDOLF MEY. *Münch. med. Wschr.*, 1959, 101: 1484.

HABITUAL ABORTION may result from various causes, some of which are not as yet discernible. The author discusses a special type of habitual abortion which occurs between the fourth and seventh months of pregnancy and which results from an insufficiency of the internal cervical os. Habitual abortion is defined as the occurrence of three successive abortions.

Cervical insufficiency is represented by an anatomic weakness of the upper cervical canal which can be present on a congenital or acquired basis. Acquired causes consist of dystocia, vaginal cesarean section, forceps delivery, and manual removal of the placenta. Occasionally the lesion results from a normal spontaneous vaginal delivery. Gynecologic causes are vigorous cervical dilatation and criminal abortion.

The clinical picture is characterized by painless cervical dilatation with some effacement, protrusion of the membranes followed by their spontaneous rupture, and subsequent labor. The degree of cervical dilatation does not seem to be related to the time at which the membranes rupture. In the diagnosis of habitual abortion, a history of midtrimester abortions is very significant as is the history of some possible causative factor.

Between pregnancies a cervix is considered insufficient if a No. 8 Hegar dilator passes easily into the uterine cavity. The diagnosis is also confirmed by the use of a radiopaque medium; a ballooning and widening of the internal os is revealed. Whether an incompetent cervical os should be treated operatively between pregnancies as advocated by Lash, or during a pregnancy as advocated by Shirodkar, is still under dispute. In either case an attempt is made to tighten the internal os.

Three hundred and eight cases of insufficiency of the internal os have been collected from the literature; 200 or 65 per cent of the patients were subsequently delivered of a living child.

—*Warren R. Lang, M.D.*

Acute Fibrinogenopenia in the Gravidopuerperal State and Its Present Day Treatment (Sindromes de fibrinogeniopenia aguda en el estado gravido-puerperal y su tratamiento actual). RAÚL GARCÍA VALENZUELA and HÉCTOR CABRERO SOTO. *Rev. gin. obst.*, Rio, 1959, 105: 259.

THE AUTHORS prefer the term fibrinogenopenia to that of acquired afibrinogenemia suggested by Dieckmann when he first described this condition. They also prefer the designation uteroplacental apoplexy to Dieckmann's abruptio placentae. In fact, the authors have claimed for more than 20 years that uteroplacental apoplexy may be due to incoagulability of the blood rather than to uterine inertia, and that, therefore, it is not always necessary to perform a hysterectomy in these patients. On the authors' service a hysterectomy is not performed, even in the presence of extensive apoplexy, if the uterus responds to the oxytocics.

The authors, at the Maternity Clinic of the Hospital of San Francisco de Borja, Santiago, Chile, began experimenting in July 1957 with the administration of human fibrinogen in the treatment of hypofibrinogenemia and afibrinogenemia, and up to the time of the present report have treated 8 patients with this preparation. In 3 of these patients there was retroplacental hemorrhage, in 4 there was postdelivery bleeding (1 postabortion), and in 1 there was embolism of the amniotic fluid.

The human fibrinogen preparation was administered in small, fractionated doses, an attempt being made in each case to give the least total quantity that would produce a satisfactory response, that is, the least amount that would produce coagulum. Of course, estimations of the blood fibrinogen were carried out systematically in each case.

In the 3 patients with abruptio placentae and retroplacental hemorrhage the results from the administration of human fibrinogen were quite satisfactory. The fetuses did not survive, but the mothers recovered without incident.

In the 4 patients with incoercible hemorrhage after separation and discharge or manual removal of the placenta, but without evidence of a premature separation as the causal factor, small doses of human fibrinogen (3, 2, 2, and 1 gm., respectively) resulted in rapid cessation of the bleeding. One patient died.

The case of embolism of the amniotic fluid was likewise an instance of amniotic infection; nevertheless, a live child was delivered by spontaneous labor and this was followed by spontaneous discharge of the placenta. The expulsion of the afterbirth was followed by grave hemorrhage and by the symptoms of embolism (cyanosis, dyspnea, and collapse). The administration of 2 gm. of human fibrinogen resulted in definitive control of the bleeding, but the patient died 8 hours later. —*John W. Brennan, M.D.*

Management of the Obstetric Patient with Hemorrhage Due to an Acute or Subacute Defibrination Syndrome. WILLIAM C. MOLONEY, LOUISE LANG PHILLIPS, JACK A. PRITCHARD, OSCAR D. RATNOFF, and Others. *Blood*, N.Y., 1959, 14: 1354.

THE EDITOR of *Blood* posed a number of questions to a panel of obstetricians and gynecologists concerning the management of the obstetric patient with hemorrhage resulting from an acute or subacute defibrination syndrome. Perhaps the most dreaded of all hemorrhagic complications in obstetric practice follows premature separation of the placenta. When fully under way it is a major emergency. The hemorrhage involves more than a simple tearing and exposure of open blood vessels. Continuation of the hemorrhage, even in the presence of what seem to be adequate measures for its control, and excessive bleeding from fresh sites during and after operations designed to arrest it force the conclusion that the uterine hemorrhage is the expression of a systemic disorder of hemostasis. Development and enlargement of this concept by Schneider and Duncan Reid and his associates hastened the early recognition of this clinical syndrome in its various guises and provided ways for probing its mechanisms and eventually for effective control of the hemorrhage.

The first two questions concerned the obstetric conditions under which a clotting defect is likely to be encountered that could be responsible for excessive bleeding, and what clotting deficiencies other than that due to defibrination may develop in complications of pregnancy.

There was unanimous agreement that coagulation disorders are most frequently encountered in obstetric practice in association with premature separation of the placenta and that the commonest defect is fibrinogenopenia. Other less common causes are a retained dead fetus, amniotic fluid embolism, placenta previa, and infected abortions. Defects in other hemostatic factors may be observed, although less frequently, namely, thrombocytopenia, deficiencies of prothrombin and accessory coagulants, or an excessive amount of anticoagulants. The hemorrhagic complications of intrauterine fetal death may come about insidiously or appear suddenly at about the time of delivery. This poses several clinical problems: How one may detect incipient defibrination in a patient with intrauterine fetal death; if this develops, at what earliest time might it be expected to appear; and whether defibrination constitutes a major problem of management before the twenty-eighth week of pregnancy.

Most members of the group believed that weekly determinations of the fibrinogen level in the plasma should be made once intrauterine fetal death is diagnosed. The hemorrhagic manifestations may appear at any time from 3 to 6 weeks after death of the fetus. Defibrination may occur as early as the sixth month of gestation but is rarely seen before the twenty-eighth week.

To be in a position to judge incipient defibrination one must, however, be familiar with fibrinogen levels in pregnant and nonpregnant women: What may be regarded as the range of values of the fibrinogen concentration in the third trimester of normal pregnancy and how this compares with the range of values found in nonpregnant females; below what concentration one should suspect a defibrination process; and what test should be made at the bedside which is most convenient and informative as to the presence and degree of defibrination.

There was uniform agreement that the fibrinogen levels in the third trimester of pregnancy are higher

by 20 to 50 per cent than the levels found in nonpregnant women. At the third trimester the fibrinogen levels are thought to range between 300 and 500 mgm. Most of the participants believed that when the level falls below 200 mgm. a defibrination process may be impending or taking place. Two of the participants believed that such is the case when levels of 150 or less are reached. The clot observation test was considered by the majority of the panel members to be the most dependable bedside estimate of defibrination.

Other questions were concerned with how much fibrinogen may be administered when the defibrination syndrome is under way; whether fibrinogen should be supplemented with whole blood transfusions, acid citrate dextrose plasma, or commercial serum albumin containing antifibrinolysin; and the danger of viral hepatitis after infusion with fibrinogen alone.

Most of the participants regarded 4 to 10 gm. of fibrinogen to be the average dose needed for an acute defibrination syndrome. In most instances, 4 to 6 gm. have been used. As much as 15 to 20 gm. may occasionally be necessary. Whole blood, preferably fresh, should be given principally to combat shock and to replace blood volume. The use of A.C.D. plasma is not advised, and there has not been sufficient experience with the use of serum albumin to warrant recommending it. There is difficulty in separating the viral hepatitis that may follow whole blood transfusions and that secondary to fibrinogen injection. It was believed that there may be a slightly higher risk of viral hepatitis from injections of fibrinogen than of whole blood. Considering the benefits of fibrinogen administration, the risk is calculated to be well worth taking. —*Charles Baron, M.D.*

Management of Premature Separation of the Placenta. JOHN Q. ADAMS, L. C. HENRY, and PHIL C. SCHREIER. *Obst. Gyn.*, 1959, 14: 724.

FETAL WASTAGE in severe cases of premature separation of the placenta approaches 100 per cent. In milder degrees of separation, the fetal loss varies from 20 to 50 per cent. In the management of this condition, the possibility of severe fibrinogenopenia or acute renal failure is an ever present threat. The use of oxytocin in the treatment of severe or total abruptio placentae is controversial. A study of abruptio placentae was made by the Obstetric Service at the City of Memphis Hospitals in Tennessee. Prior to 1954, severe abruptio placentae was managed by cesarean section. Recently, conservative therapy has been applied more frequently. A comparison is made between the management of severe abruptio placentae in 1953 and that of similar cases occurring from 1955 through 1957. In 1953, there were 36 patients with severe abruptio placentae and from 1955 through 1957, there were 91 such patients. Of the 91 patients in the second period, 59 had hypertensive vascular disease. The vast majority of these had toxemia of pregnancy.

During the last 4 years of the period studied the cesarean section rate was reduced from 50 per cent to approximately 6 per cent. A major factor in this reduction was a more extensive use of oxytocin stimulation. Almost all patients with severe abruptio placentae were given oxytocin intravenously for 4 hours regardless of the condition of the cervix. In a few patients cesarean section had to be resorted to, because of failure of the oxytocin.

The only major complication that increased when abruptio placentae was treated nonoperatively was fibrinogenopenia. In order to avoid and lessen the possibility of coagulation defects through fibrinogenopenia, amniotomy should be performed as soon as possible and should be carried out regardless of the type of labor or the condition of the cervix. The status of coagulation must be observed closely by repeated blood clot tests. In this way, the earliest signs of fibrinogenopenia may be detected promptly.

Whole blood should be used in the treatment of severe anemia and shock. In the patient with more marked fibrinogenopenia, the administration of fibrinogen is specific. When there is a live and viable infant, cesarean section remains the treatment of choice unless vaginal delivery is imminent.

—*Harry Fields, M.D.*

Antepartum Hemorrhage, a Review of 383 Cases of Abruptio Placentae and 169 Cases of Placenta Previa Treated During the Years 1944 to 1957. ROBERT A. KIMBROUGH. *Am. J. Obst.*, 1959, 78: 1161.

DURING the 14 year period from 1944 through 1957 there were 41,919 deliveries in the Philadelphia Lying-In Division of the Pennsylvania Hospital, Philadelphia, Pennsylvania. Among these, 552 patients had hemorrhage in the last trimester of pregnancy due either to abruptio placentae or to placenta previa. Premature separation of the normally situated placenta occurred in 383 patients, representing an incidence of 1 in 109 deliveries. Only cases in which there was clinical evidence of separation have been included in this review.

Hypertensive toxemia of pregnancy and hypertensive cardiovascular disease were found in only 8.8 per cent of patients with premature separation of the placenta; in 1 case direct trauma to the abdomen was possibly responsible; and in 91.2 per cent the etiologic factors were unknown. Of the 383 cases, 199 were classified as mild, 100 as moderate, and 84 as severe. Among 222 patients in whom placental separation occurred during labor, more than 90 per cent were delivered vaginally. Of the 161 instances occurring before onset of labor, three-fifths were managed by cesarean section. The over-all section rate for abruptio placentae was 29.8 per cent, including 1 case of Porro section. There was 1 maternal death, thought to be caused by amniotic fluid embolism. The uncorrected fetal mortality was 24.6 per cent and the corrected figure was 14.3 per cent.

The mild cases of abruptio placentae usually occurred in the course of labor and in these the bleeding was largely external. The cases of severe hemorrhage most often occurred before the onset of labor and the bleeding was more frequently concealed for a comparatively long period. Fibrinogenopenia of sufficient degree to be of clinical importance was found in only 4 patients during the last 5 years. Fibrinogen was administered to each patient with a deficient level.

The author stresses the following principles concerning the management of abruptio placentae. In

mild cases, the conduct of labor should be unaltered except for the administration of oxygen and increased vigilance on the part of the obstetrician. In the more severe cases, the best interests of both mother and baby are served by as prompt evacuation of the uterus as is compatible with safety, particularly in cases in which there is an associated fibrinogenopenia.

There were 169 proved cases of placenta previa in the present series, an incidence of 1 in 248 deliveries. Placenta previa was total in 23 and partial in 20; in 113 a low implantation was present; and in 13 the type of placenta previa was not stated. The cesarean section rate was 69.9 per cent. The total fetal mortality was 11.1 per cent and the corrected figure was 4.2 per cent. There were no maternal deaths.

The author recommends the following management for placenta previa:

1. Accurate diagnosis of the cause of bleeding, if possible.
2. Treatment of shock and replacement of blood.
3. Rectal examination, manual dilatation of the cervix, forcible vaginal delivery, and use of the hydrostatic bag have no place in the management of placenta previa.
4. If the cervix is dilated and the placenta previa is only partial or marginal, rupture of the membranes often will allow the presenting part to make sufficient pressure on the placenta to control the bleeding. Traction on the scalp occasionally is advisable. If the cervix is completely dilated and if the baby is small, version and extraction on rare occasions may be the treatment of choice.
5. In all cases in which the cervix is not dilated, in all instances of central placenta previa, regardless of the degree of cervical dilatation, and in those of malpresentation of the fetus, cesarean section is the safest and most conservative form of treatment.
6. The use of oxytocin in dilute solution by continuous intravenous drip immediately after delivery lessens the danger of postpartum hemorrhage.
7. Patients with placenta previa prior to the thirty-eighth week of pregnancy are treated expectantly unless the bleeding is alarming in amount and duration.

—*Lawrence I. Bernard, M.D.*

Beta Glucuronidase of the Blood Serum in Toxemias of Pregnancy (La beta-glicuronidasi serica nelle tossiemie gravidiche). F. Perrini. *Clin. gin.*, 1959, 1: 11.

In 26 women with toxemia of pregnancy, the enzymatic activity of the beta glucuronidase in the blood serum was determined with the method described by Fishman. All the patients were in the last trimester of pregnancy. The blood serum findings of 63 healthy pregnant women were used as controls. The control values for the healthy pregnant woman have been previously reported by Cisternino who found that the enzymatic activity of the beta glucuronidase of the blood serum, which is about 200 U. per cent in the nonpregnant woman, increases with the second trimester of pregnancy and reaches a maximum of 457.2 U. per cent during the third trimester. During labor the values remain elevated, and they return to normal only on the seventh to tenth day of the puerperium.

In the toxemias of pregnancy these values increased to an average of 603.6 U. per cent. Although the increase in the enzymatic activity was determined only in a limited number of cases and was on the whole not constant, it was found that in the more serious toxemias, that is, those associated with marked albuminuria, cylindruria, hyperazotemia, marked oliguria, arterial hypertension, or disturbance of vision, the enzymatic activity ranged from 688 to 922 U. per cent, with an average value of 826.5 U. per cent. In some of these more serious conditions the first convulsive attack occurred within 6 to 48 hours after the determinations were made.

When the determinations were repeated in the eclamptic phase, a sudden drop was noted which continued during the course of the illness. The titers of beta glucuronidase in these cases were lower than those of the healthy pregnant woman.

The elevated values of enzymatic activity were found to develop precociously, even appearing before the characteristic symptoms of the pre-eclampsia or the eclampsia. Thus the author believes that the laboratory study of the pregnant woman should include the determination of the enzymatic activity in the blood serum, and that such determinations offer a reliable indication of the impendence of the pre-eclamptic syndrome. —*John W. Brennan, M.D.*

Management of Late Pregnancy Bleeding. Duncan E. Reid. *Texas J. M.*, 1959, 55: 861.

Some 5 to 6 per cent of pregnant patients experience some degree of vaginal bleeding in the last trimester, but only 2 per cent will prove to have placenta previa or the development of premature separation of the placenta sufficient to demand further investigation and definitive treatment. The author applauds the tendency of recent years toward conservative treatment of placenta previa, but reminds us that in the practice of conservative or expectant treatment the mother's welfare must never be jeopardized in a sometimes futile effort to salvage the fetus.

It is difficult to document from the literature or personal experience a case of exsanguinating hemorrhage from placental previa that occurred prior to the thirty-second or thirty-fourth week of pregnancy. Consequently, the principle at the Boston Lying-in Hospital, Boston, Massachusetts in recent years has been not to hospitalize patients with bleeding prior to the thirty-second week, provided the bleeding is minimal and physical examination shows a soft, nontender uterus and normal fetal heart tones. Placentography performed before the thirty-fourth week of pregnancy is generally unsatisfactory. The author warns again that a rectal examination must never be performed on patients who bleed in the last trimester of pregnancy.

The classification of placenta previa used at the Boston Lying-in Hospital is based on pelvic findings as if the cervix were no more than 2 cm. dilated.

The classification employed is as follows: (1) Complete type: The placenta covers the opening of the internal os. (2) Partial type: The placenta covers only a portion of the opening of the internal os and the lower uterine segment up to 8 cm. dilatation. (3) Marginal type: The placenta is at or within 3 cm. of the circumference of the internal os, a circum-

stance in which the placenta would abut on the internal os were it about 8 cm. dilated. (4) Low attached type: The placenta is within 4 to 5 cm. of the circumference of the internal os near full dilatation of 10 cm. In other words, the examining finger when introduced through an internal os 2 cm. dilated can barely palpate the placenta. This condition often is referred to as a low implantation of the placenta.

The author again carefully restates the famed Boston Lying-in policy of examination with a complete double set-up and mentions that in the room wherein the vaginal examination is conducted the pelvic kit should contain Voorhees bags of various sizes and a Willett forceps.

In most patients who prove to have placenta previa, the initial bleeding is not often alarming and is often described by the patient as being a cupful or less in amount; and the patient has often ceased to bleed by the time she is admitted to the hospital. If bleeding is minimal, definitive obstetrical treatment may be postponed until the fetus has reached a maturity to survive.

In patients with central or complete placenta previa, cesarean section is generally recommended irrespective of the condition of the fetus. A patient with partial placenta previa whose fetus is mature and in good condition is also delivered by cesarean section. If the fetus is malformed or extremely premature and the bleeding is sufficient to demand termination of the pregnancy, vaginal delivery in a case of partial placenta previa is preferable to cesarean section.

Patients with marginal or low attached placenta, regardless of the state of the fetus, are treated by amniotomy, unless there is a history of long standing infertility or the patient is an elderly primipara. Amniotomy in marginal or low attached types of placenta previa is more apt to fail as a therapeutic measure if the placenta is implanted posteriorly. In the event that vaginal delivery has been selected and membrane rupture has been performed, the patient must be under constant surveillance throughout labor, and the fetal heart tones must be recorded after each contraction. The operating room must be kept in readiness. A summation of clinical experience indicates that in approximately one-half of the patients with marginal or low attached placentas fetal distress or recurrent bleeding may develop during the course of labor and require abdominal hysterectomy to avoid fetal damage.

The Boston Lying-in Hospital Clinic continues to use the classic type of incision in the treatment of placenta previa. Another recommendation of the author—consistent with his concluding paragraph in which he states that some of his opinions may be at variance with those generally expressed in the literature—is that in the patient with several children and an atonic uterus that fails to contract, supracervical hysterectomy should be performed immediately.

The author properly points out that the diagnosis of premature separation presents no special difficulties but that an evaluation of the extent of the separation possesses an element of clinical uncertainty. In the author's clinic the severe form of abruptio placentae is observed in about 10 per cent of the instances, and alterations in blood clotting are observed in approximately one-third of these cases. The severity of the disease is not dependent as much on the presence or absence of toxemia per se as on the extent of the separation and the amount of concealed hemorrhage.

When the fetus is premature, the bleeding minimal, and the physical findings essentially normal, expectant treatment is indicated. If the pregnancy is beyond the thirty-fifth week, the cause of the bleeding should be investigated forthwith and the proper treatment instituted. The preferred obstetric treatment for the mild cases of premature separation is by the conservative method, namely, induction of labor and pelvic delivery. Cesarean section is utilized in the treatment of the milder form if effective labor fails to transpire within 6 to 12 hours after amniotomy. In the mild cases, cesarean section is performed primarily in the interest of the infant. Even so, it must be realized that fetal mortality with immediate cesarean section approaches a significant rate of 5 to 10 per cent. Prematurity, hyaline membrane disease, and the effect of anoxia precipitated by the initial separation all take their toll.

By contrast, the treatment of patients with the severe form of premature separation is directed in the interest of the mother. Although one may be inclined to perform an immediate section should the fetal heart be perceptible at the time the diagnosis of severe premature separation is made, the relative maternal risk involved hardly justifies the procedure.

The author emphasizes the prompt treatment of shock and the administration of fibrinogen, should the clot observation test show delayed clotting.

After shock has been combatted, cesarean section should be considered. As a preliminary measure, the author suggests the almost routine rupture of membranes based on the suggestive evidence that the process of defibrination seems to decrease and that fibrinolytic enzyme activity diminishes or disappears entirely after artificial rupture of the membranes and the release of intrauterine pressure.

—*Thomas W. McElin, M.D.*

The Prophylactic Version of Breech Presentations During Pregnancy (Die prophylaktische Wendung der Steisslagen wachrend der Graviditaet). A. Iklé. *Schweiz. med. Wschr.*, 1959, 89: 1148.

The author diagnosed 31 breech presentations, 5 per cent of a group of 620 private patients, and as a matter of routine converted 27 successfully into cephalic presentations. Two cases were recognized too late and 2 other patients had uterine abnormalities.

The author agrees with the authors of other studies that spontaneous version can occur after 34 weeks of gestation and even during labor, as seen in 2 of his private patients. About 3 per cent of all breeches persist, and the following factors appear to come into play. Due to gravity the larger weight of the fetal head favors cephalic presentation, unless the so-called apicocaudal polarity of the available space fails to adapt the infant because of uterine malformations, asymmetry, or asymmetrical insertion of the placenta. Abnormalities of the fetal attitude, hydrocephalus, and active fetal movement might also come into play.

The author selects the thirty-second to the thirty-fourth week of gestation for external version and follows Stevenson's technique. With the hand in the vagina the breech is dislodged and the infant's head is first moved in the direction of the face and small parts. Once the infant reaches a transverse position the pressure has to be sustained and increased to complete the fetal somersault. Anesthesia is not advisable, in view of increased fetal morbidity. A depression of the fetal heart occasionally requires reversion of the maneuver. An abdominal support might be useful to prevent spontaneous return to the breech presentation. The procedure may have to be repeated at weekly intervals. The only complication in this series was a "supine hypotensive syndrome" in 1 mother, but there were no fetal problems. Contraindications to external version include malformations of the uterus, operative scar in the uterus, twins, toxemia, placenta previa, and ruptured membranes.

—*W. Dieter Bergman, M.D.*

Pregnancy in a Noncommunicating Rudimentary Horn. Elmer Gergely and Daniel J. Mason. *Am. J. Obst.*, 1959, 78: 1202.

The literature reveals that the outcome of pregnancy is seriously affected by the presence of anomalies of the genital tract. A large percentage of the patients will abort spontaneously, go into premature labor, or have a malpresentation. Fetal mortality is high, between 23 and 43 per cent, and maternal mortality is also high, in the region of 2 to 2.5 per cent.

The number of cases of pregnancy in the rudimentary horn of a bicornate uterus is small. Diagnosis is often made with difficulty. Most of the patients with a communication between the horn and the uterus will abort spontaneously. On the other hand, in the absence of a communication, rupture of the rudimentary horn will occur, seriously threatening the mother's life. Of the 13 cases reported since 1911, only 2 patients had a communication.

—*James F. Donnelly, M.D.*

Advanced Abdominal Pregnancy. E. V. Mackay. *Med. J. Australia*, 1959, 2: 642.

The author describes a case of advanced abdominal pregnancy observed at the Royal Women's Hospital in Melbourne, Australia and presents a review and discussion of the subject.

As an aid to diagnosis, the following points should be kept in mind. First, there usually will be a history of symptoms suggestive of ectopic pregnancy in the first trimester. As secondary abdominal implantation occurs, low abdominal or low back pain is noted, perhaps accompanied by giddiness or syncope. There may be pink, red, or brown vaginal discharge. Later, gastrointestinal symptoms are unusually prominent, including anorexia, nausea, vomiting, changing bowel habit, and bloating. Localized or generalized abdominal pain or painful fetal movements may be encountered.

Among the findings at abdominal examination suggestive of abdominal pregnancy are a high presenting part, malpresentation, closeness of fetal parts and fetal heart beat to the examiner, abdominal tenderness, and a mass separate from the uterus. Often a separate mass is not delineated, even under anesthesia. If one is palpated, its significance may not be realized. An abnormal position of the cervix is important. Most typically, it is high and anterior. It may be long and firm. Pelvic tenderness is common.

In the natural sequence of events, there will be an unexplained fetal death, with or without spurious labor.

Helpful roentgenographic findings include a fetus which is extended or unduly cramped, lying either close to the abdominal wall or projecting behind the vertebral column when seen in a lateral view. The uterine shadow is missing. Successive films may demonstrate a constant relationship between the gas pattern of the bowel and the gestational sac. After a diagnosis is made, intrauterine radiopaque dye will outline the empty uterine cavity.

Treatment poses several dilemmas. In early cases prompt operative interference seems clearly indicated, anticipating the probable complete removal of the placenta. If a live fetus is close to the period of viability, the proper course of action appears more difficult. If operation is long delayed, the fetus is threatened by death due to placental failure. Perhaps placental failure can be predicted by serial determinations of urinary pregnandiol.

If the fetus is dead, there is a temptation to delay surgery to allow for a reduction in placental vascularity. However, this may not take place, and there is the additional danger that the decomposing tissue mass will eventually become infected.

At laparotomy, after removal of the fetus, it must be decided whether the placenta should also be removed. Factors favoring removal include a discrete placental mass, reduced vascularity, and a lack of attachment to vital structures. There is no doubt that complete removal is followed by a safer and shorter convalescence. On the other hand, removal or attempted removal may be followed by severe hemorrhage, shock, or maternal death. Even if removal is successful, it may be necessary to sacrifice pelvic organs which might otherwise have been preserved. If it is decided that removal is unsafe, the abdomen is closed without drainage in the hope of a complete and uneventful absorption, but accepting the fact that there may be secondary infection or the necessity of secondary removal. Packing or marsupialization will only lead to infection and other complications.

—*Lester T. Hibbard, M.D.*

LABOR AND ITS COMPLICATIONS

Presentation and Prolapse of the Umbilical Cord. L. M. Norburn. *Am. J. Obst.*, 1959, 78: 1234.

Fetal mortality associated with prolapse of the fetal cord is always high. Of 16,487 consecutive deliveries, from 1951 to 1955, at the St. Mary's Hospital in Manchester, England, prolapse of the cord occurred in 0.5 per cent. The most common etiologic factor was malpresentation including face and breech presentations. Other etiologic factors are prematurity, multiple pregnancy, grand multiparity, unengaged head, hydramnios, and miscellaneous causes.

The total fetal mortality was 35 per cent. The mortality per cent was found to be higher when the cervix

was partially dilated. When it was fully dilated or when dilatation was just beginning, the mortality rates were lower. The mortality rate was higher also if the infant was premature. The presentation seemed to make little difference. In vertex presentation the mortality was 24 per cent, in breech, 22 per cent, and in transverse, 25 per cent.

The initial treatment appeared to be directed toward relieving the compression of the prolapsed cord until definitive measures could be instituted. A summary of the methods of delivery utilized in this period and the associated mortality is presented in a table. This table indicates that the fetal mortality after a cesarean section is 5.6 per cent, after forceps delivery, 22.7 per cent, and after attempted delivery by breech extraction through an incompletely dilated cervix, 40 per cent.

The conclusion derived from these data is that immediate vaginal delivery is the treatment of choice when the cervix is completely or nearly completely dilated. In the absence of this degree of dilatation, the procedure of choice is cesarean section.

—*James F. Donnelly, M.D.*

Cesarean Section in the Management of Breech Deliveries (Die Stellung des Kaiserschnittes bei der Behandlung der Beckenendlagengeburt). K. Hollstein. *Geburtsh. & Frauenh.*, 1959, 19: 843.

The author has reviewed all breech presentations since 1925 at the University Women's Clinic, Münster, Germany. Of a total of 21,784 deliveries 918 were breech presentations and two-thirds of these were frank breech. A cesarean section was performed in 8 of the 433 primiparas and in 12 of the 485 multiparas. There was no evidence, contrary to Knaus who advocates routine section in this variety, that "extended legs" caused appreciably more complications.

In the group of vaginal deliveries, fetal death occurred in 3.2 per cent of the multiparous and in 5.5 per cent of the primiparous mothers, and there was no fetal loss in the abdominal deliveries. The type of breech presentation did not seem to influence the incidence of cesarean section or fetal loss. Retrospectively, an additional 55 babies might have been saved by cesarean section but that would have raised the section rate to 12 per cent and introduced other factors. The present management is not going that far, but abdominal delivery is considered indicated when disproportion is diagnosed in time or when the second stage exceeds 2 hours and the baby is large.

—*W. Dieter Bergman, M.D.*

Perinatal Mortality in Primary Cesarean Section. Paul Pedowitz, Ralph M. Schwartz, and Morley Goldberg. *Obst. Gyn.*, 1959, 14: 764.

In the past decade there has been a rising incidence of cesarean sections and an increased utilization of abdominal delivery for fetal indications. The reported perinatal mortality figures do not appear to justify this trend.

Eight hundred and fifty-three primary cesarean sections are analyzed. This represents an incidence of 3.7 per cent. Eight hundred and sixty-one babies including eight sets of twins were delivered by primary cesarean section; perinatal mortality was 4.4 per cent.

Morbidity associated with cesarean section has been declining in recent studies. The fetal mortality is directly related to the indication for the cesarean section. Indications with a deleterious effect on the fetus have the highest fetal mortality rate.

The more liberal use of cesarean section has markedly improved fetal salvage in recent years. A review of the maternal and fetal results in high or difficult midforceps deliveries, version and extraction for both cephalopelvic disproportion and transverse lie, and breech extraction in the borderline pelvis will readily reveal the marked reduction in fetal wastage and maternal mortality brought about by abdominal delivery.

Better results have also been obtained by an earlier intervention for uterine dysfunction, and better fetal results have been obtained when cesarean section has been used in diabetes, prolapsed cord, and fetal distress as well as in placenta previa and mild or moderate premature separation of the placenta.

Better obstetric judgement and more careful attention to the newborn will further reduce fetal loss. Fetal risk inherent in cesarean sections is actually less than 0.2 per cent.

—*Harry Fields, M.D.*

Perinatal Mortality in Repeat Cesarean Section. Ralph M. Schwartz, Paul Pedowitz, and Morley Goldberg. *Obst. Gyn.*, 1959, 14: 773.

The value of elective repeat cesarean section is questioned. The most cogent reason advanced against it is the greater perinatal loss associated with repeat abdominal delivery than with subsequent vaginal delivery. Five hundred and eighty consecutive repeat cesarean sections are analyzed. This figure represents an incidence of 2.5 per cent. Five hundred and eighty-two infants were delivered, including two sets of twins, with a perinatal mortality of 3.1 per cent.

Increasing parity carries an increasing fetal risk due to the greater incidence of medical and obstetric complications deleterious to the fetus. Eight and five-tenths per cent of the infants were premature and perinatal mortality was 24 per cent. The incidence of prematurity was twice as great when cesarean sections were performed for the onset of premature labor than when performed electively. Following the concept that elective cesarean section should be performed 7 to 14 days prior to the expected date of confinement can be fraught with danger. The expected date of confinement should be calculated from the last menstrual period only when the size of the uterus corroborates this. If the estimated fetal weight at the anticipated date for delivery is less than 3,000 gm., cesarean section should be postponed. Elective cesarean section can be postponed safely in the presence of a small baby even when the cervix is ripe. Abdominal delivery should await onset of labor in these instances.

Symptomatic uterine rupture prior to labor is rare in the absence of a classical scar. As a rule, the lower segment scar will not rupture until labor is well established. To minimize the dangers of symptomatic rupture of the uterus in subsequent pregnancies, it is advisable in repeat cesarean sections to utilize the same type of uterine incision previously used.

Better observation of the patient in so-called premature labor should decrease both the incidence of

cesarean sections performed for this indication and the high fetal loss that results from prematurity. There is little risk in waiting to confirm the presence of true labor.

Improved neonatal care in the first 24 hours of life will further reduce the perinatal mortality associated with repeat section. Fetal wastage inherent in cesarean section is less than 0.2 per cent.

—*Harry Fields, M.D.*

Ovarian Abscess Secondary to Incidental Appendectomy at Cesarean Section. J. Conrad Greenwald and Arnold N. Fenton. *Obst. Gyn.*, 1959, 14: 593.

The authors review the significant statistical evidence that has been accumulating in support of the thesis that elective appendectomy at the time of cesarean section is warranted. They caution, however, that the dual procedure is not without risk and report an interesting and severe complication of this combined operation.

In a 27 year old gravida 2 an ovarian abscess developed with chronic suppurative oophoritis subsequent to an uncomplicated low flap transverse cesarean section performed for cephalopelvic disproportion and simultaneous appendectomy.

The authors properly remind us that a careful study of many more cases is necessary before a decision can be made regarding the relative risks of the combined operation versus the dangers of acute appendicitis after the age of 30. They propose that all future studies regarding this combined operation contain data regarding morbidity, antibiotics, technique of appendectomy, status of membranes, and hours of labor. The follow-up period in case reports should be long enough to rule out late complications of the combined procedure. It is suggested that logic itself demonstrates that the risk inherent in the dual operation must be greater than that of cesarean section alone. —*Thomas W. McElin, M.D.*

PUERPERIUM AND ITS COMPLICATIONS

Postpartum Panhypopituitarism. B. J. Pascoe and A. E. McGuinness. *Med. J. Australia*, 1959, 2: 635.

Every obstetrician has been made aware of the possibility of postpartum panhypopituitarism through Sheehan's classical studies of the relationship of obstetrical shock to subsequent necrosis of the anterior lobe of the pituitary gland.

This syndrome is apt to remain unrecognized for some years after the onset of symptoms, probably due to a low index of suspicion. In presenting 8 cases of postpartum panhypopituitarism, it is the authors' purpose to stress the value of early recognition of this condition, as a means of both restoring patients to near normal health and reducing the danger of subsequent coma.

Cachexia is not an essential feature of pituitary failure. The characteristic clinical pattern includes a history of collapse at delivery, an absence of lactation and menstruation, a gradual loss of pubic and axillary hair, pallor and dryness of the skin, loss of energy, apathy, mental slowing, and abnormal sensitivity to cold. Body weight usually remains normal, although anorexia and weight loss sometimes occur. The final appearance may be typically myxedematous or may resemble premature senility.

Because of their apathy, these patients are disinclined to seek medical advice, even prior to the onset of coma. If a previous medical diagnosis has been made, it is apt to be of anemia or hypothyroidism which has responded poorly to treatment.

Laboratory investigations reveal a low thyroid function and low urinary steroid levels. There may be anemia, achlorhydria, hypoglycemia, and a flat glucose tolerance curve. The ACTH stimulation test made on three successive days will help to differentiate panhypopituitarism from Addison's disease, because the former condition shows a significant response on the second or third day, whereas the later shows no response at any time. Patients with nonendocrine cases respond on the first day. The Keppler water test and insulin sensitivity tests contribute little to a diagnosis and are not without danger.

The greatest hazard of panhypopituitarism is coma which may be a sequel to misdiagnosis, intercurrent infection, or the discontinuation of replacement therapy. The cause of this coma is obscure, but it may be associated with hypoglycemia, hyponatremia and hypothermia. Possibly the secondary hypothyroidism is a factor. The coma is similar to that which is sometimes seen with myxedema. Intracellular shift of water must be important. Recovery seems to parallel the restoration of serum sodium and chloride. However, the marked electrolytic imbalance seen in Addison's disease is not generally a feature of panhypopituitarism. The use of hydrocortisone infusion in unresponsive patients may be lifesaving. At times coma is followed by a spontaneous recovery which seems to be independent of therapy. —*Lester T. Hibbard, M.D.*

NEWBORN

Recognition of Spontaneous Pneumothorax in Premature Infants. Lula O. Lubchenco. *Pediatrics*, 1959, 24: 996.

The author presents the cases of 27 patients in whom spontaneous pneumothorax developed during the initial hospital stay at the Colorado General Hospital, Denver, Colorado. The cases occurred in the nurseries for premature and full term infants during a 9 year period from 1949 to 1958. Two instances of pulmonary interstitial emphysema and 3 of pneumomediastinum without pneumothorax are included, since they probably represent variants of the same process.

The incidence of clinically significant spontaneous pneumothorax in premature infants admitted to the Premature Infant Center was 17 in 2,480 admissions or 0.7 per cent. Premature infants constituted 63 per cent of the group reported. The incidence in full term infant admissions was 10 in 8,969 admissions or 0.1 per cent. The patients described are infants in whom respiratory symptoms led to roentgenographic examinations of the chest.

The age at onset of the disease varied with the birth weight. The infants with birth weights of 1,500 gm. or less averaged 24 days of age at the onset of spontaneous pneumothorax; in full term infants the disease developed in the immediate newborn period.

The diagnosis of spontaneous pneumothorax was suspected when symptoms of respiratory distress alternated with unusual activity and an increase of symptoms when the infant was fed or removed from oxygen.

The immature infant had cyanosis or apneic spells alternating with alertness or apparent hunger. The more mature infant manifested greater respiratory distress and greater activity. The activity assumed the form of irritability, restlessness and, at times, opisthotonus. These symptoms were considered to be due to a persistent low grade hypoxia caused by the pneumothorax rather than as being manifestations of a vigorous, healthy infant. Signs of infection were minimal or absent. The importance of roentgenograms in establishing the diagnosis is emphasized.

Treatment should include relief of hypoxia by administration of oxygen in low concentration and prevention of acute respiratory embarrassment due to distention of the stomach by feedings. Removal of air from the pneumothorax or pneumomediastinum is necessary in severe cases. —*Charles Baron, M.D.*

The Effects of Pregnancy and Labor on the Respiratory Pattern of the Newborn Infant; Subsequent Morbidity and Mortality. L. A. CALKINS and HERBERT C. MILLER. *Am. J. Obst.*, 1959, 78: 1005.

AN ABNORMAL FORM of breathing that serves to identify infants in potential difficulties has been emphasized. This type of breathing is characterized by a rate that may start at about the normal of 40 per minute or somewhat higher, but that shows an increase in the first few hours of roughly 15 per minute. All deaths in the series occurred in infants with this type of breathing.

Lack of prenatal care and a lag in the onset of labor after premature rupture of the membranes seem to contribute to the incidence of this abnormal breathing.

Analgesia and anesthesia, as employed in this series, did not affect the infants' breathing. Asphyxia, even in moderate form, seemed to affect both the incidence of abnormal breathing and the subsequent mortality rate. —*Alan Rubin, M.D.*

MISCELLANEOUS

Macrocytic Anemia of Pregnancy and Pernicious Anemia in Relatives. NIELS J. THOMSEN. *Acta med. scand.*, 1959, 165: 29.

THE AUTHOR presents 6 interesting cases of profound anemia in pregnancy. Cases 1 and 2 represent severe anemia of pregnancy in a mother and her daughter; cases 2 and 3 present instances of pernicious anemia and the anemia of pregnancy in two sisters-in-law; cases 4 and 5 are examples of pernicious anemia and macrocytic anemia of pregnancy in a mother and daughter; and case 6 gives an example of profound macrocytic anemia of pregnancy with good and prompt effect from vitamin B_{12} therapy.

The author concludes that the relationship between anemia of pregnancy and pernicious anemia is more intimate than has previously been assumed and that the familial occurrence in these cases is more than mere coincidence. —*Thomas W. McElin, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Congenital Multicystic Dysplasia of the Kidney. K. V. Parkkulainen, Lars Hjelt, and Kari Sirola. *Acta chir. scand.*, 1959, Suppl. 244.

A review of statistical data indicated an incidence of congenital multicystic dysplasia of the kidney higher than one would expect. Out of this interest the authors have accumulated a wealth of information, and, in a detailed study of 17 unilateral and 2 bilateral cases of congenital multicystic dysplasia of the kidney, they have brought order to the confusion of scanty and old reports and a rational description, classification, and understanding.

The congenital multicystic renal dysplasia is a usually unilateral deformity of the kidney composed of a grapelike bunch of cysts of varying size and shape. Little normal renal parenchyma is found in the stroma of primitive connective tissue which contains various dysplastic structures. The kidney, replaced by cysts, is usually found in the conventional kidney position but may be ectopic. The ureter may be absent, rudimentary, or atresic and this atresia may be seen in the pelvis and calyces. The renal hilar vessels may be absent or anomalous.

All of the 19 patients, who were from 1 hour to 20 months old and in whom no evidence of a familial or hereditary tendency existed, were subjected to either operative examination and/or necropsy so that all but two of the kidneys so examined were subjected to microscopic study. An increase was found in the amount of connective tissue which was greater than is usually found in the congenital polycystic kidney. Perhaps the single anatomic difference between congenital polycystic disease and congenital multicystic dysplasia is in the connective tissue. In the former disorder the connective tissue is normal and without dysplastic structures, whereas in the latter the stroma may be fibrous or loose and embryonic, richly supplied with vessels and containing primitive renal elements, cartilage, or smooth muscle. In the infant kidney, scattered glomerular structures may be seen usually communicating with a short tail, the proximal tubule. Occasionally, primitive testicular tissue is found adjacent to or incorporated in the cystic mass. Calcification is seen only in the adult cystic mass.

An associated anomaly such as ureteral atresia or testicular and renal pedicle abnormalities are not unusual. Even the uterus may be duplicated, as may the cloaca, and a patent urachus as well as anal atresia and bilateral hip dislocation may be present. Esophageal atresia, various heart and great vessel defects, and rare bone anomalies have been reported.

An appropriate classification of renal cysts has resulted from these studies. The most frequently encountered are those of focal cystic dysplasia—solitary or simple renal cysts—in which the remainder of the kidney is normal. Multilocular cystic dysplasia occurs less frequently but there is usually some impairment of renal function. Multicystic dysplasia involves the whole kidney but there is a differentiation into the so-called bilateral polycystic kidney, depending upon the presence or absence of dysplastic structures within the connective tissue. Any combination is possible.

Symptoms of this disease may be few or absent and depend upon the size and position of the cystic masses. The diagnosis is usually established at operation or at autopsy. The only treatment possible is nephrectomy. The prognosis depends entirely upon the degree and number of associated anomalies.

—*Peter L. Scardino, M.D.*

The Technique and Interpretation of Nephrotomograms. H. W. A. Post and W. F. W. Southwood. *Brit. J. Radiol.*, 1959, 32: 734.

Space-occupying lesions of the kidney are frequently seen in excretion pyelograms, and nephrotomography is a valuable method of obtaining further information about their nature. The technique was originally described in 1954, and recent clinical evaluation of the results show that intrarenal masses can be diagnosed as simple cysts or neoplasms with 90 to 95 per cent accuracy.

A Robb-Steinberg needle is introduced into the antecubital vein, 5 c.c. of 20 per cent decholin are injected, and the arm to tongue circulation time is measured. The bitter taste is experienced 10 to 14 seconds from the time of injection and it is found that the arm to kidney time is practically identical. If the timing is accurate, a good arteriographic phase will be obtained and this aids considerably in the subsequent interpretation.

Twenty cubic centimeters of 45 per cent hypaque are injected initially to detect any sensitivity, after which 50 c.c. of 90 per cent hypaque and a further 5 c.c. of decholin are injected very rapidly. The first film is taken as soon as the patient experiences the bitter taste. This film should show the renal arteries and their branches. The second plain film is taken 2 to 3 seconds later and this is a nephrogram which should demonstrate good opacification of the renal parenchyma. Immediately thereafter, two or more tomographic films are taken; ideally the entire series of films should be completed in under 45 seconds.

Renal tumors have a dense vascular pattern, whereas cysts are characteristically almost avascular. In the second plain film, the nephrogram, tumors are characterized by an irregular dense opacification with a poorly defined margin; cysts show as roentgenolucent areas which are frequently surrounded by a halo of increased density. The tomographic films provide further information about the kidney, and the differentiation between cysts and tumors is more marked because any overlying gas translucencies are eliminated. The clearly defined translucency of a cyst contrasts with the irregular blotchy opacification seen in tumors. Occasionally, renal tumors undergo central necrosis, but the roentgenologic appearances remain much the same and there is no resemblance to a simple cyst.

—*James H. Holman, M.D.*

The Necessity to Suture the Renal Pelvic and the Ureteral Incisions in Pyelotomies and in Ureterotomies (Untersuchungen zur Frage der Notwendigkeit einer Nierenbecken- und Harnleiternaht bei Pyelo- und Ureterotomien). DIETRICH BORM. *Zschr. Urol.*, 1959, 52: 546.

THIS REPORT originates in the Surgical Clinic of the University of Kiel, Germany and concerns 215 patients. One hundred and nineteen patients underwent pyelotomy; in 90 of the operations the incisions were sutured and in 29 they were not. Ninety-six of the patients underwent ureterotomy; in 41 of the operations the incisions were sutured, in 55 they were not.

Since no uniform agreement has been attained by means of clinical experience among the writers on this subject, the author has attempted a statistical approach to the problem. The material here reported has been subjected to statistical analysis with regard to the period of healing, the period of drainage, and the postoperative complications of the formation of fistulas and the development of abscesses. The author, in his opening discussion, cites reports in the literature in which the suturing was thought to be a factor in the recurrence of urolithiasis, but he does not refer to this aspect of the problem again.

The method of statistical evaluation was always the same and, with one exception, always brought negative results, that is, any influence of the suturing as a factor in the aspects of the question here studied, as compared with the results of nonsuturing, could not be statistically validated. The exception concerned fistula development.

The number of fistulas developing after suture of the incision in cases of pyelotomy or of ureterotomy was shown statistically to be less than in the cases in which the incision was not sutured.

—*John W. Brennan, M.D.*

Some Considerations in the Technique of Partial Nephrectomy. WILLIAM L. PARRY and JOSEPH F. FINELLI. *J. Urol.*, Balt., 1959, 82: 562.

IN MOST INSTANCES today partial nephrectomy is accomplished by utilizing the wedge type resection in which the residual flaps are approximated by deep mattress sutures tied over fat pads, with or without interposed hemostatic material. Hemostasis is secured only indirectly by tissue pressure. The collecting system is not closed accurately, so that bleeding down the ureter may occur. A considerable amount of normal renal tissue is compressed by the sutures. Excessive pressure by the sutures frequently leads to necrosis and delays the healing of the renal wound. These conditions may lead to primary hemorrhage and such delayed complications as secondary hemorrhage, infection, and fistula.

The authors have employed various techniques of partial nephrectomy in which the blood vessels are ligated directly and the collecting system is closed by sutures. The principles of the three basic techniques used have been reported and are being employed currently in clinical series by Poutasse in Cleveland, Semb in Norway, and Murphy in Philadelphia.

The principal step in technique one is the preliminary ligation of segmental vessels deep in the hilum which supply the portion of the kidney to be excised. Using principally this technique, Poutasse now has a series of 27 cases and has had no complications. This technique provides secure hemostasis. However, it does require extra time to skeletonize the pedicle carefully. Preliminary ligation may sacrifice a larger portion of the kidney than is required in order to remove the diseased segment. This might be of some consequence to a patient with a single kidney.

The basis of technique two is the direct ligation of structures encountered by dissection within the renal parenchyma. Semb of Norway last reported a series of 184 partial resections of the kidney, primarily for tuberculosis, with extremely low morbidity. There is less operating time required in this technique than in the preliminary ligation method. No more uninvolved renal tissue than is necessary is sacrificed. Extra tissue may be taken more easily, if indicated, after the kidney has been opened. By this technique the middle portion of the kidney can be removed, as Semb has proven clinically.

The main principle of technique three is to suture the cut ends of the vessels and the collecting system after the segment has been excised. The pedicle is occluded, the capsule stripped back, and the kidney is divided transversely, not wedged. Murphy now has a series of 21 cases and has had no complications. The authors have used this method recently in 1 clinical case. They report that this is the fastest to execute of the three techniques described, because there is no meticulous dissection of the hilum nor of the parenchyma.

The three techniques carried out are the same in principle but they vary in the site at which the vessels are ligated. Hemostasis can be secured directly, and the collecting system can be closed easily. With these methods of more accurate surgical technique, partial nephrectomy ought to be accomplished with less primary hemorrhage and smaller risk of delayed complications than heretofore.

—*Ray C. Johnston, M.D.*

Renal Transplant Between Heterozygous Twins with Good Renal Function for 4 Months (Transplantation d'un rein entre jumeaux non monozygotes après irradiation du receveur). J. HAMBURGER, J. VAYSSE, J. CROSNIER, M. TUBIANA, and Others. *Presse méd.*, 1959, 67: 1771.

THIS ARTICLE reports what the authors consider to be a case of renal transplant in which the postoperative period was relatively without complication, thus permitting an accurate analysis of this critical period. The facts of this case might overthrow the existing concepts of homologous renal transplants, because this kidney lived and functioned beyond the usual time for the rejection of transplants, suggesting a possible curability of the process that ordinarily leads to the death and rejection of the transplant.

The patient, 37 years of age, was admitted to the Hospital Necker, Paris, France for the treatment of far advanced chronic nephropathy thought to be classified in the glomerulonephritic group. All of the findings suggested that the patient could survive for only a few months.

The donor from which the kidney was removed was a heterozygous twin whose dissimilarity was demonstrated by many details. The finger prints were not similar, blood groups were nonidentical, and pictures show dissimilar facial features and ears. Finally, proof was the rejection of a skin graft from the recipient to the donor taken at the time of operation. The close relationship was, however, suggested by certain general resemblances and by some analogies disclosed when a detailed study of the blood groups was made. Because the parents of the men had died it was not possible to study the antecedents of these analogies. The donor had normal kidneys as determined by urography and aortography.

The irradiation of the recipient was by telecobalt therapy. The total dose administered was 460 rads, given in 2 4-hour seances. The recipient was placed in an air-conditioned chamber where the air was filtered, introduced into the room under positive pressure, and subjected to ultraviolet light for purification. A strict bacteriologic control was kept daily. These bacteriologic precautions were gradually reduced beginning at the end of the fourth week.

The actual transplantation was performed on the day after the second irradiation. The donor was placed in hypothermia of 29 degrees F. produced by immersion in a cold bath. The donor's right kidney was removed and 10 mgm. of heparin were injected into the renal artery at the time nephrectomy was performed.

The donor kidney was placed in the right iliac fossa of the recipient. The total time of interruption of the circulation of the transplanted kidney was 40 minutes.

The course of the patient's blood picture in the weeks that followed irradiation and renal transplantation is summarized in a chart. Generally, the hematologic evolution followed the same pattern as in patients having had total irradiation, either accidental or therapeutic.

The functional evolution of the transplanted kidney was schematized into three periods which are described in detail.

At the beginning of the fourth month, the patient's general condition was excellent. The blood pressure was 140/90 mm. Hg, the red blood cell count was 4,080,000, there were 4,800 leucocytes, 64 per cent granulocytes, and 280,000 platelets; there were no proteins or abnormal cellular elements in the urine, and the blood urea was 0.33 gm. per liter. On the same day, it was determined that the function of the donor's kidney was normal with compensatory renal hypertrophy. It was calculated that the functional value of the recipient's transplanted kidney was 80 per cent of normal.

The authors considered that three essential factors were involved in the survival and function of this renal transplant: (1) the chronic renal insufficiency of the recipient; (2) the effective use of preoperative irradiation; and (3) the close relationship between the donor and recipient. It was pointed out that no one of these factors would have produced this 4 month survival and the disappearance of all pathologic signs of uremia, but it was entirely possible that the synergic effects of all three factors produced this astounding result. —*Conrad A. Kuehn, M.D.*

BLADDER, URETHRA, AND PENIS

Ureterovesical Anastomosis, the Description and Evaluation of a Technique. Albert J. Paquin, Jr. *J. Urol.*, Balt., 1959, 82: 573.

It is the purpose of this article to present and evaluate the technique for ureterovesical anastomosis designed to emulate the normal ureterovesical junction.

The ratio of the intramural length of the ureter to the diameter of the ureteral orifice in the normal patient was approximately 5 to 1. In children in whom 16 ureters were found to have reflux the ratios averaged only 1.4 to 1. The ureteral orifices were more than twice the usual size, whereas the intramural length was only half as great. No measurements of the elasticity of the intramural ureter and the surrounding structures have been made, but it seems obvious that this elasticity is also an important consideration.

Indications for ureterovesical anastomosis include disorders resulting in reflux or ureterovesical obstruction.

A technique for ureteral reimplantation has been evolved, the principal objective of which is the preservation of properly functioning renal tissue by preventing reflux and obstruction to the downward flow of urine. Two types of abdominal incisions are employed, depending on the extent of the tortuosity of the ureter. If little or no straightening is required, a Pfannenstiel incision is made and the rectus muscle is retracted laterally. If the ureter is tortuous and an extensive dissection is required, an oblique incision is made extending from the flank to the pubis with incision of the oblique and transverse abdominal muscles. The blood vessels to the ureter frequently prevent it from being straightened. After the ureter has been straightened and, to prove this, retrograde pyelograms have been made while the patient is on the operating table, the ureter is severed from its attachment to the bladder. The severed end is examined minutely for evidence of bleeding. The free flow of blood here is considered evidence that success is possible, although its presence or absence does not invariably forecast success or failure.

The superior and posterolateral aspect of the bladder is dissected free and the bladder is opened in the dome. The incision is then prolonged posteriorly to a point approximately 1 to 2 cm. above the old ureterovesical junction. At this time, measurements of the trigone and ureter are made. The opening at the site of the old ureterovesical junction is closed with a single chromic 00 catgut suture. The bladder is now stretched flat and the submucosal tunnel, 7 to 10 mm. wide and 20 to 30 mm. long, is made using sharp dissection toward the vesical neck and the trigone. At the distal end of the tunnel the bladder mucosa is incised transversely for 5 to 7 mm. If the ureter is more than 8 to 10 mm. in diameter a wedge of tissue on the avascular side is excised proximally for about 30 to 40 mm. Then the incised ureteral margins, except for the distal 10 mm., are coapted with everting sutures of No. 4-0 atraumatic chromic catgut. This is done to restore the ratio of the length of the intramural ureter to the diameter of the ureteral orifice to about 5 to 1. If the ureter is less than 8 to 10 mm. in diameter, only a single longitudinal incision is made on the avascular

side for 10 mm. A catheter is passed through the surgically devised tunnel from the inside to the outside. The end of the ureter is sutured to the end of the catheter and gently guided through the tunnel. A cuff is devised by passing No. 4-0 atraumatic catgut sutures through the bladder mucosa and muscle, the wall of the ureter, and the tip of the ureter at all four quadrants on the circumference of the ureter. When these sutures are tied, the cuff is effected. In closing the bladder no attempt is made to close the bladder muscle tightly around the ureter. Undue tension on the anastomosis is relieved by drawing the bladder superiorly and suturing it to the fascia of the psoas muscle or to the presacral fibrous tissue. A No. 6 or No. 8 French ureteral catheter is passed through the new ureteral orifice to the renal pelvis as a splint. A No. 24 or No. 26 French malecot catheter is left in the bladder for suprapubic cystotomy drainage. Penrose drains are left in the wound which is closed in a routine fashion. A preliminary nephrostomy is performed only if the ureter is greater than 1 cm. or if trouble with the newly reconstructed ureterovesical junction is anticipated.

Thirty-two patients had 40 ureters reimplanted by this technique. In the 32 patients traced for 1 to 27 months there were 25 successes, 12 failures, and 3 deaths.

A rather detailed analysis of the deaths and failures is presented. The 3 deaths resulted from sepsis arising from multiple renal abscesses. At least 2 might have been prevented if preliminary nephrostomy drainage had been instituted on both sides, particularly on the side unoperated upon. Of the 12 failures, 5 were caused by interruption of the ureteral blood supply, 4 were the result of failure to reduce the intramural ureteral diameter, 2 were due to inadequate submucosal tunnels, and 1 was the result of inadequate straightening of the tortuous ureter.

—*Ray C. Johnston, M.D.*

Obstruction of the Vesical Neck in Children. Howard T. Thompson. *N. York State J. M.*, 1959, 59: 4377.

Perhaps the most frequent cause of urinary tract infection in both the male and female pediatric patient is contracture of the bladder neck. The degree of obstruction and the efficiency of the bladder musculature are difficult to correlate with the historic facts and the cystoscopic findings obtained. There may or may not be residual urine, depending upon the work hypertrophy of the bladder. The vesical neck is found to be narrowed and the bladder wall drops precipitously, producing a true bas-fond; in the female large edematous folds are seen at the vesical neck. Trabeculations are usually diffuse but may be localized and segmental. The incidence of ureteral reflux in the young patient with bladder neck obstruction is probably greater than is usually reported, since cystograms are unfortunately not routinely performed.

Urinary tract infection secondary to an obstructive pathologic condition may be disregarded in the patient less than 6 years of age, because of the absence of fever or constitutional reactions. Significantly, however, the child who is early trained at less than 1 year of age and who voids infrequently is often the victim of an enlarged bladder due to vesical neck obstruction.

Suprapubic resection of the bladder neck was the procedure of choice in the author's male patients, and transurethral resection the preferred procedure in his female patients. Urethral dilatation and fulguration of edematous mucosal folds was the technique used in the remaining male and female patients who did not require excision of tissue.

The suprapubic approach produces an excellent view of the thickened and trabeculated bladder and the narrowed fibrotic bladder neck. The results of both suprapubic and transurethral approaches, however, have been uniformly good.

The author states that ureteral reflux need not be corrected primarily, but he prefers to observe the response to the removal of the vesical neck obstruction. After a period during which the patient has received urinary antiseptics for 3 to 12 months, cystographic studies to determine the persistence and degree of reflux are carried out. The majority of patients, the author states, will favorably respond to the relief of bladder neck obstruction and will not require surgical correction of the ureterovesical defect.

—*Peter L. Scardino, M.D.*

Technique for Construction of a Functioning Artificial Bladder. J. M. Gil Vernet. *J. Urol.*, Balt., 1960, 83: 39.

Fifteen patients who had malignant tumors of the bladder were operated on by total cystectomy and repair was made by colpocystoplasty. After excision of the bladder, the prostate, and the seminal vessels, when indicated, a portion of the sigmoid colon was freed. The bowel was reunited. The ureters were implanted into this portion of the sigmoid which must be 28 to 30 cm. in length. The new bladder was then anastomosed to what was left of the urethra by either an end to end or an end to side technique.

The advantages of this operation are that the patient has excellent urinary control and no external fistulas and can void normally through the penis.

—*S. Richard Muellner, M.D.*

Clinical and Pathogenic Considerations on Hormonal Urinary Incontinence in Women (Considerazioni clinico-patogenetiche sulle incontinenze urinarie ormonali, I.U.O., della donna). Francesco Guercio. *Ann. ostet. gin.*, 1959, 81: 355.

The urinary incontinence associated with ovarian dysfunction has received little attention in the literature, even though certain effects of estrogens and androgens on the lower urinary tract have been reported. This article is, therefore, interesting because it attempts to clarify the pathogenesis of the incontinence in cases in which previous obstetric trauma or neurologic disorders are not present.

The author believes that this type of urinary incontinence is a result of dysfunction of the gonadotropic-ovarian system and he attempts to arrive at a classification of the disorder on the basis of a rather limited number of observations.

In the young patients with primary amenorrhea, the incontinence is attributed to primary pituitary failure with the lack or diminished production of gonadotropins resulting in marked ovarian hypofunction and hypoestrogenism. This in turn is believed to

decrease the tone of the muscular wall and sphincter of the bladder and to be the basis of the incontinence. Two patients with this type of incontinence, studied by the author, responded well to cyclic therapy with estrogen, progesterone, follicle-stimulating hormone, and luteinizing hormone. A similar endocrine dysfunction may be observed in menopausal women. A case of a woman with hypogonadotropic hypoestrogenism occurring 2 years after menopause is discussed. The urinary incontinence was, at least temporarily, corrected with cyclic estrogen and progesterone therapy.

It is more difficult to postulate a hormonal basis for the incontinence of a third group of patients in early menopause who showed normal levels of gonadotropins and urinary estrogens. In 2 such patients observed by the author there was a moderate degree of prolapse of the urethra and perineal structures, secondary to previous deliveries, and hypertonus of the vesical musculature. In 1 patient cyclic therapy with androgens controlled the incontinence while in the other patient control of the incontinence was achieved only after plastic surgery on the urethra and perineum.

On the basis of the evidence presented in this article, the author's attempt to classify hormonal urinary incontinence in systematic fashion has obvious limitations and leaves many unanswered questions. It can be concluded that this type of incontinence must be rather rare (the author can produce only 3 acceptable cases) and is usually associated with hypogonadotropic hypoestrogenism.

—Franco F. Sangalli, M.D.

GENITAL ORGANS

Can Prostatectomy be Improved? GUY W. LEADBETTER, JR., JAMES H. DUXBURY, and WYLAND F. LEADBETTER. *J. Urol.*, Balt., 1959, 82: 600.

ALTHOUGH morbidity and mortality rates of the conventional suprapubic prostatectomy have decreased, the early and late complications still persist. The incidence of immediate and delayed hemorrhage, bladder spasms, prevesical infections, suprapubic urinary fistulas, and subsequent vesical neck contracture should not be considered necessary and unavoidable.

Any ideal prostatectomy should be a meticulous operation leading to absolute hemostasis. It should allow for primary closure of the bladder and the elimination of all catheter and tube drainage, as well as normal voiding without postoperative hemorrhage, infection, subsequent urethral stricture, or contracture of the bladder neck.

The operation described by the authors, they believe, comes close to being applicable to all patients with prostatic obstruction. It is not expected to replace transurethral resection or perineal prostatectomy when these procedures are indicated. The described technique combines the good features of the retropubic and suprapubic enucleation.

The patient is placed in the supine position and a 10 to 12 cm. transverse incision, 1 to 2 cm. above the symphysis pubis, is made through the skin and rectus fascia. The bladder is then exposed by separation of the recti and pyramidalis muscles. The index finger is inserted along the posterior portion of the symphysis to break into the retropubic space. The loose fatty areolar tissue is easily pushed lateralward and upward on either side. Care must be taken not to tear the puboprostatic veins during this maneuver. The index and middle finger can now straddle the prostate gland, and the tissue in the area may be easily pushed off the prostate and up and onto the bladder, thus mobilizing the operative area. A self-retaining retropubic retractor is next inserted. The bladder is depressed and retracted by a sponge on a sponge stick. The preprostatic and prevesical fat is then dissected from the surface of the bladder and the prostate. The two large prostatic capsular veins usually encountered during this dissection should be identified, divided, and ligated. The bladder incision is made first, in order to permit survey of the bladder and establishment of the position of the prostatic urethral opening and the proximity of the ureteral orifices. The incision is made obliquely so that it may be extended into a V and a Y-V plasty which is performed if bladder neck contracture is present. The incision is continued through the bladder neck and 2 cm. distal into the prostatic capsule with scissors. The incision must be made in the midline over the prostate. The bladder neck now opens widely for inspection. The scissors are placed in the plane between the adenoma and the prostatic capsule at the bladder neck and are spread; the adenoma separates readily. The mucosa covering the adenoma is next incised circumferentially at the urethral orifice, a cuff of mucosa being preserved for subsequent suturing of the bladder neck. A double hook placed in the adenoma retracts it upward while the dissection of the adenoma is carried out posteriorly with scissors. The dissection should be carried out under direct vision when the posterior and lateral cleavage planes have been established. The index finger frees the gland distally to the urethra on the lateral and posterior surfaces. The anterior portion of the adenoma is freed by sharp dissection under direct vision. After complete mobilization of the adenoma, only the urethra remains intact. Two narrow retractors are placed in the prostatic capsule and, by retraction of the adenoma, the urethra, at the apex of the gland, is visualized and divided close to the adenoma. A dry sponge is then placed in the prostatic fossa. Care is taken to leave the excess vesical neck mucosa previously dissected from the adenoma.

The hemostasis at the bladder neck is accomplished by placing figure-of-eight suture ligatures at 1, 5, 7, and 11 o'clock on the bladder neck. When meticulous hemostasis has been achieved, the cuff of bladder mucosa previously preserved is sutured into the prostatic fossa with interrupted No. 5-0 chromic catgut sutures to cover the bladder neck and the proximal prostatic fossa.

If a Y-V plasty is to be performed because of bladder neck fibrosis, the bladder incision is converted into a V, and a Y-V closure is made. If a Y-V plasty is not carried out, the prostatic fossa is closed with interrupted through and through 00 chromic gut sutures, 0.5 cm. apart. After the closure of the bladder, a balloon catheter is inflated in the bladder, not in the prostatic urethra. The incision is closed in

layers and a drain is placed in the retropubic area. The drain is removed in 36 to 48 hours and the catheter in 4 to 6 days.

The authors believe that their technique for prostatectomy reduces and controls the blood loss, allows inspection of the bladder, eliminates the suprapubic catheter drain, permits the removal of the urethral catheter 4 days after surgery, and provides for the relative absence of postoperative bladder spasms. Because of these advantages, they believe the results from this operation warrant further trial of the technique described. —*Conrad A. Kuehn, M.D.*

Combined Prostatectomy. JOHN A. HUTCH. *J. Urol.*, Balt., 1960, 83: 67.

FROM TIME TO TIME surgeons have attempted to secure hemostasis after suprapubic, retropubic, or perineal prostatectomy by means of transurethral fulguration of the bleeding points. In the past, some authors have been skeptical that good hemostasis could be secured by means of the fulgurating electrode after enucleation. To test this theory a series of 35 combined prostatectomies was performed.

After enucleation, the prostatic urethra appeared through the cystoscope like a long, acutely inflamed trench. The blood seemed to come from everywhere, and it was difficult to find the actual bleeding point because of the rapid formation of clot along the floor of the prostatic urethra. By using large quantities of irrigating fluids however, it was possible, with diligence, to secure adequate hemostasis in most cases. The advantages of this procedure are a shortened operative time, a decreased postoperative blood loss, and clearer postoperative drainage.

—*S. Richard Muellner, M.D.*

Tumors of the Testes (Considerazioni su 308 casi di tumori del testicolo). A. OLIVIERI and G. MAGGI. *Cancro*, Tor., 1959, 12: 16.

THE AUTHORS report on 308 tumors of the testes seen at the Turin Cancer Institute, Turin, Italy from 1926 to 1956.

From a review of the literature and their own cases the authors believe that seminomas arise from seminiferous epithelium, probably from the spermatogonium. This conclusion is based upon the observation that this tumor begins during the time of greatest sexual activity. The same type of crystals are seen in the tumor as in the spermatogonium, and seminomas are radioactive. The authors do not believe that seminomas and teratomas have the same cellular origin.

There were 191 seminomas and 107 teratomas. The latter were divided into 61 undifferentiated, 15 differentiated, 25 differentiated and anaplastic, and 6 chorioepitheliomas. In 18.6 per cent of the cases of teratomas a seminoma was found to coexist. In 7 per cent of the total cases the two types of tumors coexist, and the prognosis is dictated by the more malignant tumor.

The histologic diagnosis of testicular tumors is very important. The seminoma carries a mortality which is only one-half that of the teratomas. Before making a diagnosis of seminoma one must be certain that there is no evidence of an associated teratoma. The differentiating of teratomas into the different subdivisions of somatic and anaplastic elements is of minor importance.

Follow-up studies were possible on 141 patients subjected to orchidectomy for seminoma and teratoma. A high degree of malignancy was found in the teratomas, the anaplastic being the highest and the differentiated lower, but always higher than for the seminoma. —*Lucian J. Fronduti, M.D.*

Malignant Tumors of the Testes (I tumori maligni del testicolo). R. BERGONZINI, S. RUSSO, and G. BASSANI. *Tumori*, Milano, 1959, 45: 555.

THE AUTHORS report 90 patients affected with malignant tumors of the testes treated at the University of Modena, Italy, during the period from 1945 to 1958. The right side was involved in 57 per cent. In 8 patients or 8.88 per cent, a history of trauma was obtained. Ectopic testes were present in 10 patients or 11.1 per cent. Of these, 5 were bilateral, and in 5 unilateral cases of cryptorchism the tumor was always found in the ectopic testis and never on the normal side. Metastases were present in 45 patients at the time of the initial treatment.

The treatment of choice was simple orchiectomy with excision of the cord up to the external inguinal ring. Only 3 were not operated upon; 2 had widespread metastasis and 1 was a small child with leukemia. In the latter case the tumor proved very sensitive to roentgenotherapy and it was presumed to be a localized leukemic infiltration. In 3 patients a radical operation was resorted to with resection of the inguinal, iliac, and para-aortic nodes. In two of these there was evidence of distant metastasis. All 3 patients are living, the first 2 having survived for 2 and 3 years. The third patient is a recent case.

Roentgenotherapy was used for all patients including the 3 who did not have an operation. A dosage of 2,500 r was used for the seminoma and 3,500 r for the other tumors. Conventional roentgenotherapy was used for all of these patients. Cobalt therapy has been used at the authors' clinic for only 1 month or so. The roentgenotherapy followed surgery; it was not used preoperatively.

The 5 year survival rate for patients with seminomas without metastasis is 14 of 16; for tumors with metastasis, 7 of 24. The results with embryonic tumors was very discouraging.

The presence of stroma or lymphocytic infiltration is considered a good prognostic sign and the presence of glucose an indication of slow evolution. The amount of nucleic acids may indicate a greater or lesser degree of radiosensitivity.

The authors believe that more accurate classification, possible only after further progress in histologic and biochemical studies, will lead to better therapy and improved clinical results.

—*Lucian J. Fronduti, M.D.*

A New Concept in the Management of Priapism. FREDERICK B. BURT, HORST K. SCHIRMER, and WILLIAM WALLACE SCOTT. *J. Urol.*, Balt., 1960, 83: 60.

THIS CASE report deals with a 22 year old Negro who was seen at Johns Hopkins Hospital, Baltimore, Maryland, with painful priapism of 24 hours' dura-

tion. Ice and spinal anesthesia failed to reduce the priapism. Aspiration from the dorsal vein of the penis revealed bright red blood. The penis was sharply deviated to the left.

A short incision was made in the right corpus cavernosum and dark stagnant blood was removed. There were no clots. After irrigation of the corpus, bright arterial blood gushed forth. This did not reduce the priapism. It was concluded that the priapism was due to excessive arterial inflow rather than to obstruction of the venous outflow. For this reason the right pudendal artery was exposed and ligated. The priapism was at once reduced. No loss of sexual power followed ligation of the right pudendal artery.

—*S. Richard Muellner, M.D.*

MISCELLANEOUS

Aortography in Essential Hematuria (L'aortografia nelle ematurie così dette essenziali). VITTORIO GIONGO. *Urologia*, Treviso, 1959, 26: 312.

THE AUTHOR reports upon his personal experience with the aortogram in cases of unilateral renal hematuria. The series was selected on the basis of doubtful physical and pyelographic examination. The patients were divided into 4 groups.

Group 1 comprised 12 patients with a normal pyelogram and aortogram. In 9 cases the hematuria subsided spontaneously with no treatment and never recurred. In 1 patient the bleeding reappeared 11 months after the first episode. A second patient had a second bleeding episode 5 months after the first, and this time cystoscopy showed the hematuria to be bilateral. The last patient of this group was a 60 year old woman who had a right nephrectomy performed because of persistent bleeding and secondary anemia. Examination of the specimen showed a small epithelioma of a calyx, not detected by either test.

Whenever both the angiogram and the pyelogram are normal it is wise not to rush the patient to surgery but to follow him periodically in view of a possible, even though rare, carcinoma.

Group 2 was made up of 7 patients with an abnormal pyelogram and a normal angiogram. In five instances, because of the normal angiogram, it was possible to rule out the presence of a tumor. In the sixth patient the angiogram was nearly normal and the kidney was apparently normal. The last patient had a left nephrectomy performed because of a subnormal pyelogram, although the angiogram was entirely normal. Pathologic examination of the specimen did not show any abnormal finding.

The third group consisted of 4 patients with a normal pyelogram and an abnormal angiogram.

Group 4 includes only 1 patient in whom both the angiogram and the pyelogram were abnormal. The patient, a 22 year old woman, had a massive hematuria which by cystoscopy was proven to come from the right kidney. The angiogram showed bilateral multiple aneurysms of the renal arteries. The pyelogram revealed distortion of the renal pelves with dilatation of the secondary calyces.

The author concludes that his experience confirms what has already been reported. The angiogram is important in the clinical evaluation of unilateral renal lesions.

—*Maria Serratto, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Possibilities of Movement in the Craniovertebral Joints. S. WERNE. *Acta orthop. scand.*, 1959, 28: 165.

INVESTIGATION of the movements between the occiput and the atlas and the atlas and the axis is reported by the author. His information is based on cadaver dissection and roentgenographic interpretation of the findings.

He finds that the occipitoatloid joint is a fixed one; there is no translation of the bodies in movement. On the contrary, there is definite translation of the atlas and axis on movement; therefore the axis of any single motion is not fixed.

The occipitoatloid joints are likened to an elliptical or fusiform body in a trough or tube. There are two movements possible: sliding in the tube or rotation of the fusiform body in the tube on the body's own axis.

The odontoid process of the axis touches the anterior edge of the foramen magnum on anteflexion. The author attempts to demonstrate a bursa in the tissue between these bony points by means of radiopaque dye injected into the area. He has found this bursa well developed in cadaver dissections.

Finally the author demonstrates that lateral flexion carries with it some rotation of the axis in the atlas due to tightening of the alar ligaments. Therefore, tilting and turning are always combined.

—*Richard G. Saxon, M.D.*

Displacement of the Medial Epicondyle into the Elbow Joint. BJÖRN ROSENDAHL. *Acta orthop. scand.*, 1959, 28: 212.

DISPLACEMENT of the epiphysis of the medial epicondyle of the humerus is a common injury in adolescents. An investigation at the communal hospital in Varberg, Sweden into 138 elbow fractures in children has shown 26 fractures of this type, an incidence of 18.8 per cent.

It appears from this investigation, as in the majority of reports, that, next to the supracondylar, medial epicondylan displacement is the most common elbow fracture in children. The fracture is more common among boys. Of the 26 cases in this report there are 16 boys.

In cases with inclusion of the fragment in the joint cavity there can be diagnostic difficulties. If a slight ulnar paresis or numbness in the ulnar area is found the diagnosis is easy. These symptoms will be present in 30 to 60 per cent of cases, according to different authors. There are often only a slight radial subluxation of the forearm and a cubitus valgus as clinical signs.

The treatment is an operative or manipulative reduction. There is a certain risk of resultant ulnar paresis at manipulative reduction and some authors advise against this method. The reduction must be done immediately. —*Preston J. Burnham, M.D.*

Posture, Mobility, and Strength of the Back in Boys 7 to 16 Years Old. ERLING ASMUSSEN and K. HEEBØLL-NIELSEN. *Acta orthop. scand.*, 1959, 28: 174.

THERE IS much confusion about proper posture. The criteria of good posture that are commonly accepted are not necessarily the standards of good function. Many of the concepts of physiotherapists, teachers of physical education, and physicians are guided by esthetic notions which have no correlation with function.

In order to evaluate the criteria of posture, the authors utilize the work of Mølhave. The following measurements were made:

Anatomic measurements of (a) dorsal kyphosis; (b) lumbar lordosis; (c) pelvic inclination; (d) the height of the subject; (e) the width of the femur at the femoral condyles in relation to the height; and the (f) weight of the subject. Tests of muscular strength were made by (a) dynamometer test of the trunk muscles and (b) test of grip. Tests of flexibility consisted of measuring the flexion and extension of the spine.

The subjects were 201 Danish school boys ranging in age from 7 to 16 years. Pathologic cases were not included. The boys were divided into groups according to their height, each 10 cm. increase representing a new group. Each group was then further divided into two groups according to muscular strength, those above average and those below average.

The trends shown here are that lordosis increases slightly and kyphosis decreases slightly with increasing height. The relation of the height to the width of the femoral condyles, the breadth index, shows a tendency to slimmer form with increased height. Strength increases exponentially with increase of height. Flexibility of the spine increases in forward flexion but remains constant in extension.

Correlations were drawn between various factors to show trends. A more pronounced lordosis goes with increased flexibility and increased strength of the back extensors. Correspondingly, increased strength was positively correlated to increase of kyphosis and lordosis.

In summary it was found that as boys increase in height and age there is increase in muscle strength and an increase in the lumbar lordosis. There is a decrease in the kyphosis of the dorsal spine, in the pelvic inclination, and in the breadth index. Those boys with an increased lumbar lordosis were stronger and, vice versa, stronger backs have increased curves.

These results cast grave doubt on the value of the Harvard University standard types in which the ideal is a flatter back. —*Richard G. Saxon, M.D.*

Some Problems in Treatment of Disorders of the Hip Joint in Various Age Groups. DENYS WAINWRIGHT. *Proc. R. Soc. M.*, Lond., 1959, 52: 864.

SEPTIC early childhood arthritis of the hip joint described by Thomas Smith in 1874 differs in many respects from similar conditions in older children. Of 64 cases analyzed by the author, the onset oc-

curred in 16 within the first 6 months of life, Staphylococcus aureus being the predominant organism. Early diagnosis and active treatment are essential to avoid such disastrous sequelae as septic bone necrosis due to occlusion of blood supply to the femoral neck (Trueta) and dislocation accompanied by kinking and traction of the circumflex vessels for the joint capsule. The early stages are not easy to detect, and any tenderness or relative immobility are more likely due to infection than to any other cause. In addition to necessary aspiration or arthrotomy, the hip should be immobilized in abduction, if necessary combined with traction and the utmost attention to prevent dislocation. In cases in which this complication has occurred the author's experiences with reconstruction procedures have been disappointing because of loss of stability as growth progresses. Further upward displacement can be partly prevented by wearing of a caliper brace until at an appropriate time some type of arthrodesis can be performed. A few cases have been benefited by an extra-articular shelf arthrodesis.

In beginning slipping epiphysis, pinning or introduction of wire yields good results. Any residual deformity or irreducibly displaced epiphysis is corrected by subtrochanteric osteotomy. The high cervical osteotomy is not recommended because of late avascular necrosis of the femoral head.

In osteoarthritis of the hip the author's experiences have been disappointing, with instability and recurrence of pain after use of the replacement prothesis. He therefore prefers the McMurray displacement osteotomy or some form of internal fixation that allows for early ambulation on crutches after 3 to 4 weeks. Great care should be taken that the appliance does not hold the fragments apart and that the limb is in proper position before the plate is finally screwed to the shaft. —*E. H. Bettmann, M.D.*

Analysis and Results of Conservative and Operative Treatment of Legg-Perthes' Disease in Children (Beobachtungen und Ergebnisse bei der konservativen und operativen Behandlung des Morbus Perthes'). HANS BETTE. *Zschr. Orthop.*, 1959, 92: 74.

FROM 1929 TO 1958, 463 children with Legg-Perthes' disease were treated. An average of 15 such patients were seen every year. Hospital records and roentgenograms were used for evaluation. All cases were classified as idiopathic except 2; trauma in 1 and an infection in 1 were found to cause the disease. In 1 patient in whom the cause was questionable, a biopsy was made. Roentgenographic disappearance of reactive changes in the femoral head was considered as healing of the disease. On an average, the transition from degenerative to reparative stage was found to be 9.7 months.

One hundred and ninety-two hips were treated conservatively. Twelve per cent were affected with bilateral Perthes' disease. The treatment consisted in cast immobilization of the leg in abduction and internal rotation. During the reparative stage of the illness the cast was replaced by a brace. In patients with an advanced stage of the disease when first seen, an ischial weight bearing brace was used alone. In evaluating the end results of the treatment, it appeared that the earlier the treatment was instituted the better the results. When a deformity of the femoral head was present at the beginning of the treatment, it could not be corrected with immobilization. Statistically, equally severe deformities were found in younger children as in those older. Subjectively, the deformities in the older children were much more severe. Of 163 cases, 58 showed an involvement of the femoral head only, and in 105 the neck and the epiphysis were involved. Of the latter series, 73 per cent showed a poor end result despite adequate treatment. The involvement of the femoral neck in many cases led to a premature closure of the epiphysis and shortening of the extremity. In 17 patients changes in the acetabulum were seen, which the author attributed to an adaptive reaction of the socket to the deformity of the head.

Forty-eight hips were treated by operation. In 8 patients a femoral head nail was used, in 13 a bone graft, and in 27 multiple bore holes in order to accelerate the vascularization. After operation the hips were immobilized in a cast for a period of 2 to 3 months. In all patients operated upon the disease process appeared to be accelerated and the recovery time was shortened. In 9 patients who had a grafting procedure, a premature closure of the femoral epiphysis was observed. Of 5 patients treated with femoral head nails, a narrowing of the femoral epiphysis and an elongation of the femoral neck developed in 3. The nail appeared to cause a stimulation of the growth. In 10 patients who had the drilling procedure, narrowing of the epiphysis and shortening of the femoral neck developed in 4. No premature closure of the epiphysis was observed.

From these studies the author suggests the following treatment of Legg-Perthes' disease: (1) Early cases with a well preserved femoral head should be treated conservatively. (2) Early cases with a deformed head or with involvement of the neck should undergo conservative treatment. Only when revascularization does not occur is surgical intervention indicated. (3) Old cases of Perthes' disease with a poor tendency to healing should be treated surgically. (4) A femoral head nail appears to be superior to the drilling or grafting procedure, since it does not damage the epiphysis. When the nail is removed, the growth of the femur can continue. (5) In early cases surgical intervention should not be undertaken, since it may lead to a premature closure of the upper femoral epiphysis. —*George B. Wichman, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Treatment of Cuff Ruptures of the Shoulder. OTTO VERBEEK. *Arch. chir. Neerl.*, 1959, 11: 266.

THE CUFF APPARATUS consists of the common aponeurosis of the subscapularis, supraspinatus, infraspinatus, and teres muscles. The aforementioned muscles execute the first 60 degrees of abduction of the arm and the balance is claimed by the deltoid. Moreover, the infraspinatus acts as the endorotator, whereas the supraspinatus, infraspinatus, and the teres minor represent the exorotators of the shoulder.

Spontaneous and posttraumatic ruptures of the cuff are concomitants of trophic changes, laxity,

and/or aging. Failure to recognize avulsion or severe laceration of the cuff, especially in the geriatric patient, is prone to produce functional impairment with pain and limited motion. Unless, the author states, the diagnosis is made reasonably early, the hope of restoration of function is looked upon with disfavor. Delayed conservative or operative treatment of a degenerated cuff is tantamount to failure.

The policy of treatment advocated by the writer is briefly that of (1) hospitalization of all patients with shoulder injuries for proper evaluation as to the extent of damage to the cuff; (2) placing the arm in 90 degree abduction, midrotation, and 30 degrees anteflexion; (3) early active exercises; and (4) physiotherapy in the outpatient department.

Surgical therapy entails a horseshoe incision, acromial osteotomy, inspection of the intra-articular degree of violence, and anatomic restoration of the involved parts.

In a series of 18 cases, observed in the Department of Orthopedics at the Wilhelmina Hospital of Amsterdam, Netherlands cuff injuries were treated by plastic fascial repair in 6 cases; suture of the cuff in 3 cases; surgical intervention in 9 cases; and conservative treatment in 9.

By and large, the results achieved by the author appear to be quite satisfactory, despite the small series of cases presented.

—*Samuel L. Governale, M.D.*

Treatment of Recurrent Dislocation of the Patella by the Method of MacCarroll and Schwartzmann. PREBEN THESTRUP ANDERSEN. *Acta chir. scand.*, 1959, 117: 252.

THE TREATMENT of recurrent dislocations of the patella may be either conservative or operative. Conservative treatment consists of the application of various forms of plaster casts, or the use of active conservative treatment such as re-education of the quadriceps muscle, or both. Operative treatment involves operations on the patella, the distal end of the femur, or the tibia, or arthrodesis of the knee joint. The commonest surgical procedures are plastic repairs of the capsule, transplantation of the patellar ligament together with the tibial tuberosity, or ligamentous transplantation alone. Fascial grafts may or may not be used. These methods have been combined in some clinics.

The author analyzed the treatment of a series of patients with recurrent dislocation of the patella and felt that the results did not equal those mentioned by MacCarroll and Schwartzmann in 1945. He therefore changed to their method of treatment which essentially is simultaneous transplantation of the inferior patellar ligament and the tibial tuberosity medially and inferiorly with plastic repair of the tendon of the semitendinosus. The after-treatment consists of the application of a plaster cast for 8 weeks followed by re-education of the muscles involved, but active use of the extremity within the cast is stimulated from the fourteenth day after operation.

A series of 27 women and 9 men, whose ages averaged 26.4 and 23.6 years respectively, was observed after operation for 18 months to 7 years, an average of 4.6 years. Seventy-five per cent of the patients were completely free from dislocation after the operation. The author concluded from the follow-up study of these 36 cases that the MacCarroll-Schwartzmann operation for recurrent dislocation of the patella tends to prevent dislocation and instability in the knee, but does not reduce the frequency of subsequent arthrosis of the knee joint. Actual improvement in pronounced deformities of the knee joint was obtained after a change in the direction of the traction on the patella in some cases, and in 2 cases pronounced valgus position of the knee joint was eliminated.

—*Einer W. Johnson, Jr., M.D.*

FRACTURES AND DISLOCATIONS

Medullary Fixation of Fractures of the Forearm. FRED P. SAGE. *J. Bone Surg.*, 1959, 41-A: 1489.

THERE ARE essentially two different principles of medullary fixation in use today. The first is the three point fixation described by Rush, in which the nail does not fill the medullary canal. In this situation, fixation depends on the springiness of the metal which maintains contact between the device and the bony cortex at three points along the medullary canal. This means that a curved pin is placed down a straight canal, or a straight pin down a curved canal. The other principle is that of Küntscher, in which firm contact of the nail against the cortical walls of the canal both above and below the fracture gives fixation. Certainly, if the metal in this instance is sufficiently rigid, immobilization will occur.

The unsatisfactory results often encountered in medullary nailing of the forearm have been due primarily to either lack of fixation of the radius in anatomic position or failure to maintain that position. It has been strongly emphasized that in order to preserve pronation and supination, the normal arc as well as the rotational alignment of the diaphysis of the radius must be preserved. The fact that failure to maintain this arc also leads to the distraction of the fragments of a fracture of the ulna, with consequent malunion of the radius and nonunion of the ulna, is not unknown. The ulna, being a relatively straight bone, is well suited for medullary fixation, and the rate of nonunion after medullary fixation of solitary fractures of this bone is acceptable. This is not so, however, with the curved radius.

Results are reported of a detailed study of the size and contour of the medullary canal of 100 radii from cadavers. Medullary nails, triangular in cross section, have been devised for the forearm bones. The nail for the radius is prebent in accordance with anatomic data and is made of a metal tempered to the proper resilience and rigidity.

The straight triangular ulnar nail may be used in any diaphysial fracture of the ulna if proper precautions as to the size of the canal are observed. The prebent triangular nail for the radius is indicated in diaphysial fractures, except those in the proximal and distal fourths, if the medullary canal measures not less than 3 mm. in its smallest diameter at the midpoint of the shaft. If butterfly fragments are present, supplementary fixation by wire loops may be needed. The nail should not be used in bone that requires considerable reaming; the nail must engage the cortex firmly and, if the cortex is too thin, the nail may still

be used, but external immobilization until solid union is shown by roentgenogram is mandatory.

Results are reported for the first 50 patients in whom these nails have been used. Despite some early clinical error and some serious preoperative complications, there were fewer instances of malunion in this series than the authors were able to obtain with closed methods, and fewer instances of nonunion than have resulted from other methods of open reduction.

Supplementary fixation of the radius with a wire loop or a screw was used in four of the ulnar fractures. This makes a rate of supplementary fixation of 14 per cent in both the radius and the ulna.

The technique of insertion and extraction of the nails is described and the indications are given for their use in diaphysial fractures. The technique is exacting and if not properly performed may produce complications.

In the discussion of the paper it was pointed out that the radial medullary curves in both planes were more apparent than real and presented no more problem for a straight nail than does the minor curve of the femur. This fact was disclosed in a study of roentgenograms that were made of the radii of 121 cadavers at the Walter Reed Hospital. A metal marker was used at Lister's tubercle.

—*C. Fred Goeringer, M.D.*

The Treatment of Fractures and Pseudarthroses of the Scaphoid (Les fractures et pseudarthroses du scaphoïde carpien à propos de 56 cas). P. Decoulx, J.-P. Razemon, and P. Lemerle. *Lille chir.*, 1959, 14: 113.

The authors divided the fractures of the scaphoid into three groups: fractures of the middle third (80 per cent), fractures of the upper third (12 per cent), and fractures of the distal apophysis (6 per cent). The remaining fractures (2 per cent) were of diverse types.

In 30 per cent of the cases the fractures were complicated by other lesions, including dislocation of the lunate bone in 10 per cent, fractures of the distal extremity of the radius in 10 per cent, and fractures of the styloid process of the ulna in 6 per cent.

Twenty-five per cent of the fractures are not recognized with routine anteroposterior and lateral films and special techniques must be used. Even then some fractures may not be diagnosed. In doubtful cases new films should be taken after 3 weeks.

Twenty patients were treated with plaster casts that remained in place from 1.5 to 2.5 months. After this type of treatment there usually was no pain, but the amount of force and the movements were restricted. Union of bone occurred in only 50 per cent of the cases. Thirty patients were treated by immediate mobilization; the results were generally less satisfactory than with plaster immobilization. Forty per cent of the results were bad (pain and limited motion). There was nonunion in 80 per cent. Resection of the styloid process was carried out four times with very satisfactory results.

Nonunion is the major complication of these fractures, especially those of the middle and upper third; however, it is often very well tolerated. The authors conclude that in their opinion:

1. No treatment is necessary for nonunion when it is well tolerated.

2. For nonunion of fractures of the middle third accompanied with stiffness, diminished grip, and pain the authors prefer resection of the styloid process. They dislike bone grafts because of the poor end results and residual pain.

3. In nonunion of a comminuted fracture an acrylic prosthesis may be indicated; a stiff, but painless, wrist results.

4. When there is a pseudarthrosis of a small and necrotic proximal fragment it should be removed. The results are excellent. —*J. C. Mulier, M.D.*

Treatment of the Transverse Fractures of the Middle and Proximal Phalanges of the Finger (Zur Behandlung der Querbrueche im Mittel- und Grundgliedschaft der Finger). Paul Ferdinand Nockemann. *Medizinische*, 1959, p. 1678.

Reviewing the literature on fractures of the proximal and middle phalanges of the finger, the author was impressed with the lack of uniform opinion as to the duration of treatment of these fractures. According to Moburg, the middle and distal third of the proximal and middle phalanges consists of marblelike compact bone which contains only a very few blood vessels. When a fracture occurs through these areas a decalcification of the bone takes place, followed by revascularization and subsequent deposition of callus. Moburg suggests that because of these anatomic variations of the bone the healing of these fractures does not occur before the tenth to sixteenth week. He suggests that these fractures should be immobilized for this period of time. The bone structure of the proximal ends of the phalanges is cancellous, and for these fractures immobilization for 5 to 7 weeks is sufficient. Many other authors in the European literature advocate the same duration of immobilization.

The author has reviewed 994 fractured fingers treated in 1958 at his clinic. There were 32 transverse fractures involving the proximal and middle phalanges distal to the middle third. Most of the patients were miners who sustained injuries from a crushing rock. The treatment consisted of a plaster of paris splint with the fingers in functional or flexed position. Soft tissue wounds that were less then 10 hours old were debrided and closed. In patients with open wounds which were not closed, healing of the fracture was delayed. Fourteen fractures of the middle phalanges in the middle third healed in 24 days. Some fractures of the proximal phalanges healed in 33 days. The average duration of total disability was 40 days for the middle phalanges and 46 days for the proximal. Of 32 injured individuals 18 resumed hard labor after the stated period of time. In the author's opinion this is a good functional test of whether or not the fractures have healed. In 2 cases a tear of the extensor tendon and of the joint capsule delayed the healing of the fractures.

Roentgenograms in the author's cases showed that first formation of bone occurred subperiosteally. It was present in 3 to 4 weeks after the fracture. The new bone formed a supporting cuff inside of which a bridging of the fracture occurred in 4 to 6 weeks. In 6 to 8 weeks a remodeling of the bone through the

fracture occurred. The author suggests that in these fractures a compression of fragments is necessary for rapid healing and that if traction is applied to the fractured finger it may delay healing.

In conclusion, the author states that, on the basis of the reported cases, he believes that in uncomplicated cases immobilization of fractures of the middle and proximal phalanges through the middle and distal third should not exceed 3 to 5 weeks. With this short immobilization period a normal function of the finger returns rapidly and the time of total disability is shortened. —*George B. Wichman, M.D.*

Results in Nonsurgical Treatment of Congenital Dislocation of the Hip Joint. (Text in Polish). TADEUSZ MYŚLIBORSKI. *Chir. narz. ruchu,* 1959, 24: 205.

THE AUTHOR reviews the cases of 100 patients with congenital dislocation of the hip in whom treatment was begun in the first 3 months of life. Eight patients had a familial history of the disorder. Eighteen patients had been delivered as breech presentations. The treatment consisted of the application of a Frejka's pillow, the Ortolani type of splint, or bilateral plaster boots affixed in abduction. The time of treatment varied from 6 to 9 months, depending upon how early it was instituted. It was thought that the anteversion improved gradually and, therefore, derotational osteotomy should be delayed to the age of 4 or 5, when it might no longer be necessary.

The treatment with Frejka's pillow was most satisfactory, and was free from any complications in 66 patients. The smaller group of 19 patients (24 hips), who were treated with closed reduction under anesthesia and plaster immobilization, had a high complication rate and in 11, coxa plana developed. With increased experience, the author applied abduction treatment to all patients up to the age of 2 years. He believes that when this method fails open reduction should be performed rather than closed reduction and cast immobilization. The latter method gives a high per cent of complications.

—*Z. W. Sobol, M.D.*

Aseptic Necrosis of the Femoral Head in Lateral Hip Fractures (Hueftkopfnekrosen nach lateralen Schenkelhalsfrakturen). PETER MICHAEL JANTZEN and ULRICH SCHUSTER. *Zschr. Orthop.*, 1959, 92: 50.

EIGHT HUNDRED patients with pelvic and hip injuries were reviewed by the authors. In 11 patients with lateral hip fractures aseptic necrosis of the femoral head developed. Of the 11, 8 were in the younger age group whose upper femoral epiphyses were still open. A high incidence of aseptic necrosis in children is attributed to the difference of blood supply to the femoral head. In children there are only two sources, craniodorsal and caudodorsal vessels which pierce the capsule before entering the femoral head. In adults, when these blood vessels are injured, a compensation may occur from the metaphysis or from the ligamentum teres femoris.

Three types of femoral head necrosis are described: rapid, slow, and protracted. In rapid necrosis the circulation is completely obliterated and substitution of the femoral head occurs within 1 year. In protracted necrosis the head is partially viable and crumbles gradually under weight bearing over a period of many years. In lateral hip fractures a protracted course is seen most commonly. Severity of the deformity of the femoral head in aseptic necrosis depends on the age of the individual. In younger children the joint space is usually preserved and deformity resembles Perthes' disease. In older children the head is flattened, the joint is narrowed, and the acetabulum shows reactive changes. These conditions result in osteoarthritis of the hip joint. Similar changes are seen in adults. Because of isolated islands of necrotic bone in adults, reactive changes in the femoral head persist and are responsible for the formation of vacuoli and bone spurs. A destruction of the joint space eventually occurs. Since vascular damage is mostly responsible for aseptic necrosis, it usually occurs during the time of injury. However, in many instances, a forceful manipulation of the injured hip or open reduction damages the remaining blood vessels which may still be functioning after the original injury.

The authors conclude that aseptic necrosis of the femoral head in lateral hip fractures is caused by the interruption of circulation to the femoral head, similar to what one sees in medial fractures of the hip.

—*George B. Wichman, M.D.*

A 10 Year Analysis of Intertrochanteric Fractures of the Femur. MATHER CLEVELAND, DAVID M. BOSWORTH, FREDERICK R. THOMPSON, HUDSON J. WILSON, JR., and TADAO ISHIZUKA. *J. Bone Surg.*, 1959, 41-A: 1399.

THE AUTHORS, who have derived their analysis of 239 consecutive intertrochanteric fractures from the orthopedic services of St. Luke's Hospital, New York, New York, have endeavored to show that internal fixation of the hip with some prosthesis is an established procedure. Their best method of internal fixation is accomplished, by and large, with the Jewett nail apparatus. Ninety-seven per cent of their patients were treated by internal fixation.

The ages of the patients varied from 23 to 101 years and the mean average was 75 years. Female patients predominated in a ratio of approximately 8 to 1. Incidence and classification of fractures vividly indicate that the commonest type of fractures involved the peritrochanteric area, in 60.3 per cent; that the paratrochanteric, or base of the neck was next with 18.5 per cent, followed by the subtrochanteric with 14.7 per cent. Allied diseases and pathologic lesions conducive to hip fractures are briefly enumerated as malnutrition, arteriosclerosis, advanced age, heart diseases, diabetes, renal insufficiency, senile and arthritic changes, hemiplegia, and falling out of bed at home or in the hospital. In this regard, it is of interest to note that 63.9 per cent of the patients fell at home, that falls on the street accounted for 19.8 per cent, falls in the hospital for 9.2 per cent, and that violent trauma claimed a minimum of 6.8 per cent. Interestingly enough, no mention was made of the iatrogenic falls caused by drugs.

Treatment was nonoperative in 10 and by open reduction in 229 of this series of 239 consecutive hip fractures. The interval between injury and open reduction averaged 2.9 days. Hence, prompt operation

appears to be mandatory in the authors' philosophy of therapy. From incision to closure, operating time averaged almost 60 minutes. This included operative roentgenologic checkup on pin insertion. Ten per cent of nails penetrated the articular cartilage and were later removed. The length of the recommended Jewett nail used in this large series varied from 3 inches to 3.75 inches. Average duration of hospital stay was 53 days.

Fatalities encountered during hospitalization numbered 24 patients or 10.5 per cent. The average time of their death was 34 days after operation. Causes of deaths were pulmonary emboli in 6 patients, congestive heart failure in 6, myocardial infarction in 5. pneumonia in 2, and various other causes in 6.

The average time for achievement of complete union was 4.5 months. Nonunion ensued in 2 cases.

The article includes 14 roentgenograms and a discussion by Dr. Carlo Scuderi.

—*Samuel L. Governale, M.D.*

The Treatment of Fractures of the Femoral Shaft. ANTHONY J. BIANCO, JR. *Minnesota M.*, 1959, 42: 1579.

THE GREAT ADVANTAGE of the intramedullary nail is that it provides efficient immobilization of the fracture in anatomic reduction and yet allows early motion of the hip and knee and prompt ambulation with weightbearing on the fractured extremity. Joint stiffness and muscle wasting are markedly reduced and long, expensive periods of hospitalization are shortened. The ideal condition for the intramedullary nail is a fresh, transverse, simple fracture of the middle third part of the femoral shaft in an adult person.

Use of the intramedullary nail in compound fractures of the femoral shaft should be subject to the same rigid restrictions that are imposed on the use of other internal fixation devices in compound fractures.

The intramedullary nail also has very special advantages in the treatment of pathologic fractures or impending pathologic fractures of the femoral shaft. Pain usually is well controlled and early ambulation is permitted when the nail is used, thus reducing the possibility of the complications resulting from inactivity. In addition to metastatic lesions of bone from neoplasms, lesions of the bone resulting from Paget's disease, hyperparathyroidism, and osteogenesis imperfecta can be controlled successfully with the intramedullary nail.

The greatest disadvantage to the use of the intramedullary nail is the fact that a surgical procedure is required to insert it. Although this is a disadvantage common to all operative methods, insertion of an intramedullary nail often can be particularly formidable. The closed or so-called blind method of nailing in which the nail is driven down the shaft without exposure of the fracture is mentioned here only in passing and only to condemn it, particularly when the procedure is carried out under fluoroscopic control. Open reduction is used. Complications which are peculiar to intramedullary nailing are given.

The closed method of treatment of fractures of the femoral shaft can be used in many situations in which the use of the intramedullary nail is contraindicated. It consists of manipulation of the fracture into satisfactory position, usually with the use of anesthesia, and then maintenance of reduction with traction in a splint or by the use of a plaster hip spica cast. The greatest advantage of the closed method, in some respects, is that no open operative interference is required. In the presence of infection or when infection is likely to occur, no other method can compare with the closed method of treatment. The greatest disadvantage to the closed method, whether it be the traction method or use of the spica cast, is the long time required to obtain union of the fracture.

In some fractures of the femoral shaft, open reduction and internal fixation are indicated, yet the rigid prerequisites for use of the intramedullary nail cannot be met. In such a situation, adequate internal fixation can usually be obtained with any one of several devices in which a blade or three-flanged nail is inserted into the femoral head and neck and an attached plate is screwed to the shaft, immobilizing the fracture.

Compound Dislocation of the Knee with Popliteal Artery Injury. JOHN G. RAFFENSPERGER and JOSEPH HINKAMP. *Arch. Surg.*, 1959, 79: 799.

THE AUTHORS report a case of compound dislocation of the knee with popliteal artery injury in which treatment was successful. An injury of this type frequently results in amputation or marked disability due to arterial impairment.

After reduction by flexion and traction under spinal anesthesia, chosen to reduce vasospasm, brisk arterial bleeding occurred from a completely severed popliteal artery. Anastomosis was achieved with interrupted everting sutures of No. 5-0 silk. No attempt was made to suture the extensively torn joint capsule, lateral ligaments, cruciate ligaments, and synovial membrane. After pulsations were noted in the dorsalis pedis and posterior tibial arteries, papaverine, paravertebral blocks, and large doses of antibiotics were given and continued for 5 days. The knee was kept in 90 degree flexion by an anterior mold for 3 weeks, gradually extended to 120 degrees, and immobilized for 7 more weeks. The only deficit was a zone of hypesthesia along the lateral aspect of the foot. Stability of the joint returned after the necessary prolonged immobilization and quadriceps exercises.

In this type of injury the massive soft tissue damage tends to disrupt the collateral circulation with subsequent gangrene and necessary amputation. In this case the youth of the patient and the promptness of surgical intervention appear to have hastened the excellent recovery. —*E. H. Bettmann, M.D.*

The Treatment of Fresh Open Fractures of the Leg (Traitement des fractures ouvertes de jambes récentes). J.-M. BONVALLET, P. DAUTRY, and J. GOSSET. *Sem. hôp. Paris*, 1959, 36: 503.

IT IS THE OPINION of the authors that the greatest dangers in the treatment of fractures of the leg consist of skin loss and skin necrosis, which causes osteomyelitis, nonunion, and sometimes necessitates amputation of the leg. In 62 fractures they tried to overcome these difficulties by primary closure of the wound. The wound edges are excised and the wound is thoroughly

debrided. Certain principles should be kept in mind while enlarging the wound: there must not be sharp angles, pedicles should be large, and there is always a possibility of further interventions. A long, posterolateral, counterincision is often used; this area is later covered by skin grafts. In 4 patients the wounds were not sutured, in 58 the wounds were sutured primarily, and in 18 a counterincision was made.

After primary skin closure there was not one case of infection of the wound or the bone. There was superficial necrosis in only 6 cases and deep skin necrosis in only 2 cases. Two patients died of pulmonary embolus.

In 9 cases continuous traction was used, in 27 cases a plaster cast was applied, and in 26 cases immediate internal fixation was carried out.

Bone grafts were used secondarily in 6 of the 9 patients treated by traction, in 11 of the 27 treated by plaster casts, and in 10 of the 26 treated by internal fixation. Bone grafts were used early when nonunion seemed inevitable, an average of after 49 days.

Consolidation was obtained in 175 days in open fractures treated with a cast and in 210 days after immediate internal fixation. —*J. C. Mulier, M.D.*

Hinged Casts in the Treatment of Tibial Plateau Fractures. Irving Mauer and Arthur Friedman. *Bull. Hosp. Joint Dis.*, N.Y., 1959, 20: 61.

The authors describe the results in 8 patients with tibial plateau fractures treated by means of a hinged cast and no weight bearing. They believe that this permits sufficient immobilization to restore collateral ligament stability and sufficient early motion to restore a good range of motion.

The method entails the use of an initial cast to relieve pain and permit swelling to subside. This cast is in as full extension as possible to obtain the best alignment. A second cast is applied and, after hardening, the knee portion is removed and hinges are incorporated laterally and medially. After extension of 180 degrees and flexion beyond 90 degrees is obtained, increasing passive and active exercises are instituted. No weight bearing is allowed for 90 to 120 days.

—*Richard G. Saxon, M.D.*

ORTHOPEDICS IN GENERAL

Clinical Application of Enlargement Radiography in Orthopedic Surgery. Yasuo Sugiura. *Nagoya J. M. Sc.*, 1959, 22: 131.

In enlargement roentgenography the degree of magnification of the layer farther away from the film becomes greater than that of the layer nearer to the film resulting in the so-called distortion effect of the magnified roentgenographic image. The method is useful, however, for visualizing bony and cartilaginous structures in greater detail. Metaphysial and epiphysial changes, bone tumors, osteochondritis dissecans, and temperomandibular changes can be detected.

For stereoscopic double enlargement the distance from the focus to the object as well as that from the object to the film is 40 cm. and the tube-shift distance is 4 cm. Arthrography of the knee joint in 5 different projections is considered indispensable for the diagnosis of disorders of the semilunar cartilage. For the best results the central ray should be directed 2 cm. laterally and 2 cm. medially from the midline of the knee joint with a focus-object distance of 40 cm. and a focus-film distance of 80 cm. Magnified shadows of the contrast medium are visualized making the separately projected meniscus involvements visible.

As a general rule the following magnifications were used in this study: 3 to 4 times for observation of the cervical vertebrae, 2 times for the dorsal and lumbar vertebrae, and 5 to 6 times for the fingers and toes. —*E. H. Bettmann, M.D.*

Needle Biopsy in the Differential Diagnosis of Destructive Processes in the Vertebral Column. A. Koch, E. A. Van Slooten, and J. F. Hampe. *Arch. chir. Neerl.*, 1959, 10: 41.

In cases in which a careful clinical examination, the taking of a history, and roentgenographic study do not definitely establish a diagnosis in lesions of the spine, a needle biopsy can be of great benefit. The authors use a hollow, stainless steel, trephinelike needle with a short bevel, 20 cm. in length with a 2 mm. bore. Near the end of the needle the wall is 0.25 mm. thick, but the remainder of the needle is twice as thick. A sharp three-pointed stylet is inserted into the needle and used to perforate skin, muscle, and the vertebral cortex. When the marrow cavity has been reached the stylet is withdrawn and the needle is pushed forward by slow rotatory movements. As much marrow as possible is then aspirated and the needle is withdrawn also by means of rotatory movement. The specimen is placed in Susa's solution.

Six cases are presented with a brief clinical history and reproduction of the photomicrographs. In 1 case, a destructive lesion of the seventh thoracic vertebra was observed and was thought to be tuberculous in origin. A needle biopsy was suggestive of a lymphosarcoma, possibly a Ewing's sarcoma. The second case was that of a 77 year old man in whom the diagnosis of prostatic carcinoma with vertebral metastases was confirmed by the needle biopsy. In a 38 year old woman, the clinical, roentgenographic, and laboratory findings were suggestive of a fracture of the vertebral body with secondary degenerative changes. The needle biopsy showed the process to be a metastasis of a carcinoma of the salivary gland. In a 29 year old male patient who complained of pain in the right knee and thigh, a diagnosis of tuberculous spondylitis of the third lumbar vertebral body was made. A needle biopsy revealed unusual cells with characteristics of tumor cells. The patient died within a short time after the examination and at autopsy a malignant melanoma of the right suprarenal gland with metastases to the third lumbar vertebra was found.

A 58 year old male who had been treated previously for tuberculous disease of the pleura and the right shoulder complained of pain in the lumbar spine. A needle biopsy confirmed the presence of tuberculosis in the fifth lumbar vertebra. Another patient, 62 years old, complained of pain in her back, predominantly in the region of the eighth thoracic vertebra. Needle biopsy revealed Paget's disease.

—*George I. Reiss, M.D.*

Radiosodium Clearance Rates as Indicators of Femoral Head Vascularity. PATRICK G. LAING and ALBERT B. FERGUSON, JR. *J. Bone Surg.*, 1959, 41-A: 1409.

ACCORDING TO THE AUTHORS avascular necrosis of the femoral head develops in 17.8 to 33 per cent of the fractures of the femoral neck. In fracture-dislocation of the hip joint, the percentage of aseptic necrosis is comparable. They present a preliminary report of a method for the early recognition of femoral head necrosis. Both experimental and clinical data emanate from the Orthopedic Department of the University of Pittsburgh and the Veterans Administration Hospital in Pittsburgh, Pennsylvania.

Heretofore, there have been five methods to ascertain femoral head avascularity: roentgenography; histologic studies; phlebography, or assessment of the vascularity by the injection of radiopaque dye into the femoral head; and studies of radiophosphorus pickup after the intravenous injection of P^{32}. This method has the advantage of yielding the diagnosis in 90 minutes. The fifth method, promulgated in part by the authors, is that of the radiosodium clearance studies and is alleged to be the most reliable of the aforementioned procedures.

Na^{24} is considered the most suitable isotope. It disintegrates into beta particles of 1.39 million electronvolts and gamma photons which easily penetrate the bone and overlying muscles and can be counted by a scintillation mechanism. Since Na^{24} has a half life of 15.06 hours, it is an ideal isotope from the standpoint of safety. Briefly, the technique involves the use of 50 to 60 μc./ml. of solution of the Na^{24} isotope in a leakproof stainless steel syringe, injection of the solution into the femoral head, and reading of the rate meter on the logarithmic scale. Counting is continued for 10 minutes.

In 15 previously devascularized femoral heads of large mongrel dogs there was a clearance rate of 5 per cent in 10 minutes, indicating complete devascularization. In another group of 11 femoral heads the clearance rates were between 20 and 50 per cent, indicative of vascularization. Four femoral heads yielded a 10 to 20 per cent clearance. This result was assessed as partial devascularization.

Clinically, the procedure has been extended to 9 fractures of the femoral head in humans who have had gratifying results from treatment.

—*Samuel L. Governale, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Fall in Pressure in Radial Artery During Reactive Hyperemia. JOHN M. WALLACE and EUGENE A. STEAD, JR. *Circulation Res.*, 1959, 7: 876.

REACTIVE HYPEREMIA establishes a gradient of hypotension in the hyperemic vessels relative to the rest of the arterial tree. That gradient is increased in hypertensive patients and in normal subjects who are given infusions with levarterenol. The gradient may falsely suggest arterial occlusions or narrowings between the aorta and the hyperemic bed—in these experiments, the radial arteries. The fall in pressure toward the hyperemic vessel is due to the viscous resistance to flow in vessels stemming from the aorta, not to obstruction. That resistance increases as the rate of flow increases. —*Leonard D. Rosenman, M.D.*

The Hyperemia of Reconstructive Arterial Surgery. F. A. SIMEONE and E. A. HUSNI. *Ann. Surg.*, 1959, 150: 575.

THE AUTHORS investigated the hyperemic period which is known to follow successful reconstruction of arteries that have been occluded by chronic obliterative disease. This postoperative increase in circulation is peculiar in that it remains high even under conditions in which reflex vasoconstriction would normally occur. It lasts a variable number of days and is associated with pitting edema of the foot, and sometimes of the leg, when the patient becomes ambulatory. Twenty-nine patients were studied.

Almost identical studies were made preoperatively and at various times in the postoperative period.

In rooms in which both temperature and humidity were controlled, measurements were made of the digital arterial pulse in the great toe, the rate of digital blood flow in the great toe, and the temperature of the skin of the second toe. Both lower extremities were always studied at the same time. Tests were performed at an ambient temperature of 20 degrees C. and at a relative humidity of 30 per cent. Records were made of the rate at which reflex vasoconstriction and vasodilatation occurred, as well as of the nadirs and plateaus reached after 90 minutes of exposure to the respective test situations. The reflex vasoconstriction was induced by exposure to a cool environment of 20 degrees C.; reflex vasodilatation was induced by immersing both forearms in constantly circulating water at a temperature of 43 to 44 degrees C. according to the technique of Gibbon and Landis, supplemented by blocking the posterotibial nerve with 1 per cent procaine when reflex vasodilatation did not occur. After their operations, the patients were studied in this manner almost daily for the duration of their hospital stay, which averaged 12 days. Tests were not made if any fever was present. The patients who had hyperemia at the time of discharge from the hospital were tested at weekly or biweekly intervals until the hyperemia disappeared, or up to 7 weeks.

The physiologic mechanism primarily responsible for the phenomenon is believed to be a reduction in the tone of the arterial and arteriolar smooth muscle resulting from chronic diminution of the normal stimulus, stretch, for the contraction of smooth muscle. Normal tone of arterial smooth muscle, vascular resistance, and blood flow are restored approximately 1 to 9 weeks after normal intravascular pressures have been restored by means of reconstructive arterial surgery. —*Harold Laufman, M.D.*

Technique of Endarterectomy. WILEY F. BARKER and JACK A. CANNON. *Am. Surgeon*, 1959, 25: 912.

THE AUTHORS emphasize that in order for endarterectomy to be effective, the atherosclerotic vessel must be involved in a segmental manner and adequate inflow and outflow tracts must be present. Success depends upon the ability to develop a cleavage plane between the atheromatous "sequestrum" and the relatively normal medial wall.

A detailed consideration of aortoiliac endarterectomy is presented with clear illustrations and a step-by-step consideration of the operative procedure. The authors recommend tape occlusion for control of flow before arteriotomy, longitudinal arteriotomy rather than other incisions, and repair of the partially occluded side before the more severely effected side is treated.

Heparin is utilized throughout the procedure, a 10 mgm./100 c.c. solution with an initial injection of 10 to 15 c.c. and 3 to 5 c.c. introduced every 15 minutes until removal of the catheters. Failure to remove debris remaining after the upper limit of the aortic dissection has been carried out may account for thrombosis of the repaired segment in operations otherwise technically perfect. Repair is performed from below upward with the running stitch on a short straight needle. Sutures should be placed no more than 2 mm. wide and 2 mm. apart in the aorta and iliac vessels; in smaller vessels, including some small proximal external iliacs, 1 mm. is the maximal bite allowed. Femoropopliteal endarterectomy is mentioned, but for details the reader is referred to a previously published paper. Heparinization is maintained in almost all cases for 24 to 48 hours. Antibiotics are not used. Ambulation after aortoiliac endarterectomy may be as prompt as desired.
—*Allan D. Callow, M.D.*

Late Arterial Embolectomy. HENRY HAIMOVICI. *Surgery*, 1959, 46: 775.

THE POTENTIAL value of late embolectomy, beyond the well-established temporal limitation of 10 to 12 hours after onset of ischemia, has been greatly neglected, judging by the experience of the author and other vascular surgeons. Ten cases of late embolectomy for occlusion of the iliac, femoral, and popliteal arteries after a time lapse of 13 hours to 20 days are presented. In 5 patients there was complete restoration of blood flow and in the other 5 embolectomy failed

to prevent gangrene but in 2 of the unsuccessful cases is credited with lowering the level of amputation.

Analysis of the data on these patients suggests that four factors may govern the successful outcome of late embolectomy: (1) the intima is relatively damage free in spite of the embolus; (2) there is nonadherence of embolus and secondary thrombus to the intima; (3) a patent distal arterial tree exists prior to embolization; and (4) pretreatment with anticoagulants is carried out before embolectomy.

In a previous publication on the course of untreated and medically treated arterial emboli in 300 patients the author found that: (1) in 13 per cent there was marked ischemia of the limb and early death of the patient within 24 hours; (2) in 27 per cent there was massive ischemia with subsequent gangrene occurring within a few days after onset; (3) in 18.3 per cent there was marked initial ischemia subsequently partly subsiding and resulting in chronic postembolic ischemia; (4) in 25.3 per cent there was marked initial ischemia subsequently subsiding completely; (5) in 10.7 per cent the degree of circulatory recovery could not be determined because of the patient's death a few days after onset or because of inadequate follow-up; and (6) in 5.7 per cent there was an asymptomatic embolism. In the present series, most of the 10 patients fall into groups 2 and 3 of the above classifications.

The author also summarizes results in 26 patients treated by late embolectomy, reported by six groups of vascular surgeons, involving the popliteal, common and superficial femoral, common iliac, aorta, and axillary arteries. Eighteen of the twenty-six late embolectomies were performed within 48 hours after onset, and the time interval in 7 ranged from 3 to 19 days. Of 26 cases, 18 were successful, 7 resulted in gangrene, and in 1 case the result is not indicated. These findings indicate that some patients with persistent, severe, postembolic manifestations, regardless of time lapse from the onset of occlusion, may benefit from late embolectomy. —*Allan D. Callow, M.D.*

Occlusive Disease of the Carotid Artery. Alfred J. Luessenhop. *J. Neurosurg.*, 1959, 16: 705.

This timely review is based upon 486 proved cases of carotid occlusion culled from the available literature. The cases are divided into two main categories: (1) spontaneous occlusions and (2) occlusions occurring after either surgery or various illnesses.

There were 384 cases of spontaneous occlusion which were classified in four groups depending upon the initial symptoms. Group 1 included those with a sudden or apoplectiform type of onset. As could be expected, this group carried the greatest initial mortality with a low incidence of recurrent symptoms. There was usually slow, variable improvement. Twenty-five per cent of the patients returned to some type of employment at the end of 2 years. The second group consisted of those with a gradual change of symptoms over a period of days, weeks, or months. There was usually waxing and waning of the symptomatology. The intermittent third group consisted of 97 patients. Although the symptoms might occur suddenly, oftentimes there would be almost complete reversible neurologic signs. However, by the end of a year, 80 per cent had some permanent neurologic manifestation. The fourth group of 98 patients included those with associated symptoms such as amaurosis fugax, seizures, severe headaches, syncope, or psychic changes. Eventually these patients showed more specific lateralizing signs and the changes noted in the other groups.

Occlusion of the carotid artery occurred as a complication after head injuries, cervical trauma, intracranial surgery, neck surgery and after various illnesses such as influenza, pneumonia, septicemia, diabetic coma, or coronary thrombosis. This group had a higher initial mortality as is to be expected.

In most cases in which the carotid artery had been surgically occluded for the treatment of aneurysms, removal of the occlusion apparently gave no better results than those found when the occlusion was not removed. This group should give the best indication of the results that might be anticipated in surgical therapy of this disease by the removal of the occlusion. If this were so, then the best that one could hope for would be only "a somewhat greater chance of complete recovery."

In the various case reports in the literature regarding surgical therapy for spontaneous occlusion of the carotid artery, the results were seldom excellent on a percentage basis, especially when compared to the natural life history of these patients. It must be anticipated, however, that in patients showing signs of failure with only partial occlusion there is severe atheromatous disease elsewhere, and the long term prospect will be poor even with the restoration of normal flow in a single internal carotid.

—*Jack I. Woolf, M.D.*

Stroke Associated with Elongation and Kinking of the Internal Carotid Artery, Report of 3 Cases Treated by Segmental Resection of the Carotid Artery. Julian K. Quattlebaum, Jr., E. Thomas Upson, and R. L. Neville. *Ann. Surg.*, 1959, 150: 824.

In the past 5 years considerable surgical progress has been made in the treatment of obstruction and stenosis of the carotid artery. In the cases described in the literature the patients have had atheromatous plaques, with or without secondary thrombosis.

The 3 cases presented in this article represent partial occlusion of the internal carotid artery due to elongation of the carotid vessel with kinking and associated transient hemiparesis. These patients were treated successfully by resection of the carotid artery and end-to-end anastomosis. The evaluation of the success of the procedure was based on the clinical results.

The authors believe that this condition is more common than formerly suspected and with the continual investigation of patients with the carotid syndrome, more instances of cases of this type will be discovered. —*Richard E. Gardner, M.D.*

Coarctation of the Abdominal Aorta with Stenosis of the Renal Arteries and Hypertension. Albert A. Brust, John M. Howard, Milton R. Bryant, and John T. Godwin. *Am. J. Med.*, 1959, 27: 793.

Coarctation of the abdominal aorta is rare. Two such cases with severe hypertension associated with

stenosis of both the aorta and renal arteries in which autopsy was performed are reported. The first patient was a 14 year old boy who had had severe hypertension for 5 years. There was a precordial systolic murmur and a murmur which was heard anteriorly over the abdomen and posteriorly in the lumbar region. Femoral pulses were equal and forceful. There was no rib notching. Percutaneous translumbar aortography revealed a wedgelike constriction of the left renal artery and poor filling of the aorta immediately below the renal ostia. The left kidney was removed and there was no significant drop in blood pressure. The boy died 3 weeks after discharge from the hospital with massive intracerebral hemorrhage. At autopsy there was narrowing of the aorta at the level of the renal artery and narrowing of both renal arteries at their origin.

The second patient was a 24 year old white woman who had been suffering for 2 years from severe hypertension after her fourth pregnancy. There was a loud systolic bruit, and a palpable thrill in the epigastric region and over the lumbar spine. Pulses in the lower extremities were normal. The blood pressure in the legs was only slightly less than that in the arms. Percutaneous translumbar aortography revealed narrowing of the abdominal aorta for a distance of 3 cm. at the level of the origin of the renal artery. A retrograde aortogram also revealed narrowing of the abdominal aorta and the right renal artery. In hopes of visualizing the left renal artery and celiac axis an anterograde aortogram was made through the left brachial artery and 50 ml. of 70 per cent urokon were injected. After this injection there was evidence of cord damage at the level of the second cervical vertebra and the patient died 24 hours later. At autopsy the abdominal aorta was narrowed by a thickened, constricted segment beginning 2 cm. proximal to the origin of the renal arteries and extending 2 cm. distal. Also 4 cm. proximal to the level of the renal arteries the aortic lumen was markedly narrowed by a valvelike structure originating from the posterior aortic wall. It was thought that this valvelike structure was in part responsible for the reflux of contrast medium into the cerebral vessels.

The usual features of coarctation of the aorta were lacking in these patients except for the systolic bruit and the thrill over the abdomen and lumbar spine. In both patients the severe hypertension was of the Goldblatt type because of the narrowing of the lumens of the renal arteries due to the intimal thickening which extended from the aorta into the proximal portions of the renal arteries. It appears likely that the renal artery lesions were initiated by the high velocity jet produced by the coarctation. In reviewing the literature the authors were able to find 15 similar cases for comparison. —*George R. Holswade, M.D.*

Safer Operation in Aortic Saddle Embolism, 4 Consecutive Successful Embolectomies via the Femoral Arteries Under Local Anesthesia. V. L. WILLMAN and C. ROLLINS HANLON. *Ann. Surg.*, 1959, 150: 568.

SUCCESSFUL REMOVAL of saddle emboli in 4 consecutive patients is reported. Removal was by aspiration through the femoral artery under local anesthesia. This technique, first employed by Ravdin in 1941, is reported to have several advantages over the transabdominal route, especially in poor risk patients. Bilateral groin incisions are used. Arteriotomies are made in the common femoral arteries and a large thin-walled catheter connected to a high vacuum suction apparatus by a glass T tube is passed centrally. Bleeding through the vent indicates drainage from collateral vessels into the iliac artery; cessation of this bleeding suggests that the catheter has impinged on the embolus. The clamp is then removed from the suction line and placed on the vent. Any aspirated blood or clot can be observed through the glass tube. Similar aspirations are carried out first on one side, then on the other. These maneuvers tilt fragments of the clot over the saddle to the side initially cleared and a subsequent aspiration on the initially cleared side is required. Heparin solution is used liberally.

In the discussion Shumacker presented evidence to indicate that he has operated upon equally poor risk patients transabdominally with no greater risk than with the technique employed by the authors.

—*Harold Laufman, M.D.*

Resection of the Aorta for Malignant Invasion. RICHARD A. LIM and DWIGHT C. MCGOON. *Arch. Surg.*, 1959, 79: 614.

SURGERY OF THE AORTA to date has been confined chiefly to the treatment of nonmalignant lesions of the aorta itself, such as coarctation, aneurysm, and occlusion. Local involvement of the aorta by a malignant invasive lesion may, in certain selected instances, now warrant aortic resection. Unless the involvement of the aorta by malignant invasion is clearly localized, aortic resection probably is not advisable.

Resection of the aorta was required to enable complete excision of a malignant tumor infiltrating the abdominal aorta in one patient at the Mayo Clinic. The excised terminal portion of the aorta was replaced with a prosthetic graft.

Effect of Bilateral Ovariectomy on Coronary Artery Disease and Serum-Lipid Levels. M. F. OLIVER and G. S. BOYD. *Lancet*, Lond., 1959, 2: 690.

THE INCIDENCE of coronary artery disease differs considerably in men and women. The peak incidence in women occurs about 15 years after the menopause and this is 5 years later than the age of maximum incidence in men.

The authors studied a group of women who had been operated upon 20 or more years previously in the gynecologic department. The series included 31 women with unilateral oophorectomy and 36 women with bilateral oophorectomy. Their cardiac status was evaluated by means of a history, a physical examination, an electrocardiogram, and the determination of the serum-lipid levels.

The results of this study, although the number of patients is admittedly small, show a significant increase in coronary artery disease in the women who had had bilateral oophorectomy and in whom the level of serum lipid was elevated. The incidence of coronary artery disease in women who had had unilateral oophorectomy was similar to that in a control group not operated upon.

The authors compared their findings with those of other investigators who have suggested that ovarian involution (menopause) results in an elevation of serum lipid and a progressive increase in the incidence of coronary artery disease. From this study it is concluded that bilateral oophorectomy should be avoided if possible in premenopausal women, but when it is necessary to perform this operation exogenous estrogen replacement therapy should be given until approximately the age of 50.

—*Richard E. Gardner, M.D.*

The Pathogenesis of Hypertension in Stenosis of the Aortic Isthmus (Zur Pathogenese des Hochdrucks bei Aortenisthmusstenose). W. Herms and E. Wetzels. *Deut. med. Wschr.*, 1959, 84: 1859.

In stenosis of the aortic isthmus there is elevated blood pressure in the arms and lowered blood pressure in the legs. Many authors have attributed this to the mechanical hindrance of the stenosis, a theory which seems to be confirmed by the fact that after operative correction of the anomaly the blood pressure drops in the arms and rises in the legs.

Further observations also have shown that later the blood pressure may rise again. Thus other factors, possibly renal in origin, may be active; Scott and Bahnson produced hypertension in dogs by creating an artificial stenosis of the aortic isthmus; the tension dropped when one kidney was transplanted to the carotid artery and the other extirpated. Presence of a neurogenic factor is suggested by Fono's work. He was unable to produce hypertension in animals by an artificial stenosis of the aortic isthmus if they had been previously sympathectomized.

The authors studied kidney function in 30 patients with stenosis of the aortic isthmus; they used the PAH-clearance and inulin clearance tests. They found no evidence of diminished renal plasma flow. This confirms the findings of Tonelli, and also of Genest. These studies indicate that ischemia of the kidneys (Goldblatt effect) is not a mechanism of hypertension in stenosis of the aortic isthmus. However, the question arises as to how much we can carry over from animal experiments, where an artificial, abrupt change in hemodynamics is produced, to the human, where the condition is present in the fetus and collateral circulation forms from the start.

Some investigators have suggested a humoral mechanism; however, if there were such a factor one would expect an increase in vessel resistance in all circulation areas. Crumpton found none in the cerebral vessels, and Bing found no increased resistance in the extremities in cases of stenosis of the aortic isthmus.

If one accepts the most probable explanation, that mechanical factors as a result of hindrance of flow produce the hypertension proximal to the stenosis, then the behavior of the renal circulation must be regarded as an adaptation to the abnormal hemodynamic situation. In this the pressure in the renal artery is reduced—this has been demonstrated by retrograde catheter measurements through the femoral artery and the aorta. With renal plasma flow demonstrated to be normal, even though renal artery pressure is diminished, one must assume a diminution of the intrarenal vessel resistance. Rein's studies showed that the kidney circulation is partly self-regulatory; by an unknown mechanism the renal resistance increases in renal artery hypertension and diminishes in renal artery hypotension, thus maintaining a constant plasma flow. Pertinent to this point, no evidence of diminished glomerular filtrate has been found in investigations of stenosis of the aortic isthmus.

The chief point made in the article is that the hypertension of stenosis of the aortic isthmus (either previous to operative correction or recurrent subsequently) does not seem to be on the basis of any demonstrable abnormalities of renal function.

—*William B. Gallagher, M.D.*

Surgical Treatment of Femoropopliteal Arterial Occlusive Disease. D. Emerick Szilagyi. *Am. J. Card.*, 1959, 4: 632.

For the purposes of determining the prognosis, progression, and operability of peripheral occlusive arteriopathy, angiography alone possesses the reliability and accuracy to make it a practical tool; the author uses no other diagnostic aid. The visualization of the arterial tree from the level of the renal arteries to the level of the popliteal branches is obtained through a translumbar aortic puncture, percutaneous femoral arteriograms are seldom made.

Operative indications are divided into four groups. In the first group the discomfort from exercise is not severe enough to interfere with the patient's livelihood or normal mode of living, and operative treatment is not advised. The patients in the second group have a history of sudden onset of severe ischemia after a period of intermittent claudication. Pathologically, the underlying changes are those of a fairly well localized segmental occlusive process, with a superimposed sudden terminal thrombosis, and the affected limb usually shows rapidly developing gangrene. If the obstruction is not corrected, gangrene will ensue. In the third group there is a long history of intermittent claudication and angiography reveals diffuse involvement. It is essential to assess carefully the state of the aortoiliac segment, and when indicated, its reconstruction may often bring about enough improvement to make an operation for the femoral disease less urgent or unnecessary. The fourth clinical group gives the least cause for the exercise of judgment or skill. These patients have long-standing progressive disease with established gangrene.

Contraindications to reconstructive surgery include severe coronary arteriosclerosis (except where there is impending gangrene or severe rest pain), and cerebrovascular or renal arteriosclerosis. Of 444 patients seen between 1 September 1956 and 31 August 1958, angiography was recommended in 415 or 93 per cent for the evaluation of operability. Of these, 244 or 59 per cent were found to be suitable for surgical exploration. Of the original 444 patients 58 per cent actually underwent a reconstructive surgical procedure. Thromboendarterectomy was used in only about 4 per cent of patients with femoropopliteal occlusive disease, although it is used in the treatment of aortoiliac involvement whenever conditions permit. The most commonly used surgical technique in the treatment of femoropopliteal occlusive lesions is grafting by the bypass method with plastic prostheses. The

author uses a long femoropopliteal bypass in all cases of operable femoral or femoropopliteal occlusive disease. The graft extends from the external iliac or common femoral artery to the distal popliteal artery. The results of surgical operations for femoropopliteal occlusive disease are much less satisfactory than those obtained in the aortoiliac area with regard to both early and late figures. For aortoiliac disease there is a 2 year cure rate of 85 per cent, whereas in the femoropopliteal area it is 70 per cent. In a group of 150 patients with femoropopliteal reconstruction who were followed up for 4 years, the patency rate was 35 per cent. During the same period the patency rate in aortoiliac operations had dropped only 10 per cent. If past experience can be projected into the future, a 70 per cent 2 year cure and 50 or 60 per cent 5 year cure seem to be reasonable expectations. The angiographic investigation of cases of peripheral arterial occlusive disease has brought about a rather surprising change in our concept of the incidence of Buerger's disease. A large proportion of cases that would have been classified as thromboangiitis obliterans have been shown, by angiographic studies, to be instances of arteriosclerosis obliterans occurring in patients in the younger age groups. The author prefers to have the diagnosis corroborated by histologic proof.

—Albert M. Schwartz, M.D.

Clinical Aspects and Treatment of Thrombophlebitis. Bernard Seidenberg and Lester Breidenback. *N. York State J. M.*, 1959, 59: 4402.

The authors review the prevailing opinions concerning the etiology, recognition, and treatment of thrombophlebitis. Classification should be according to the extent of involvement rather than the type of thrombosis. It is recommended that the management of venous thrombosis should be based on anticoagulant drug therapy. At present vein ligation is reserved for the occasional case in which the anticoagulants have failed or are contraindicated and for suppurative thrombophlebitis. Ligation of the inferior vena cava is much more effective in these instances than is ligation of the superficial femoral vein.

An important advance in the management of major deep vein thrombosis is thrombectomy as advocated by Mahorner. The lumen is restored by suturing the incision in the vein without ligation; this is followed by regional heparinization. A continuous drip is maintained for 72 to 96 hours keeping the coagulation time between 15 and 25 minutes. The legs are exercised with the patient in bed. Graded ambulation with the patient wearing compression bandages is begun soon after intravenous heparinization is discontinued. It is hoped that the method may result in better function and less postphlebitic edema than occurs with present measures.

Recently there has been much interest in the therapeutic value of trypsin as a thrombolytic and anti-inflammatory agent. Trypsin administered intramuscularly in small doses was found to have a nonspecific anti-inflammatory action, but evidence is lacking as to its thrombolytic properties. In the early treatment of acute superficial or deep thrombophlebitis the chief merit of the intramuscular administration of trypsin is only its ability to hasten resolution of the accompanying inflammatory reaction. No evidence exists regarding effective lysis of deep venous thrombi. Emphasis is to be placed on the role of carefully controlled rehabilitation and the prevention of sequelae of chronic venous insufficiency after thrombophlebitis of the deep veins.

—Allan D. Callow, M.D.

Clinical Manifestations of Primary Varicose Veins, an Evaluation of Incompetent Communicating Veins Diagnosed by Tilting Phlebography. Fritz R. Mathiesen. *Acta chir. scand.*, 1959, 117: 468.

The purpose of this investigation was to study whether incompetence of the communicating veins per se exerts any influence on the symptoms in untreated patients with varicose veins. A total of 275 patients with primary varicose veins were studied by tilting phlebography prior to surgery. According to both theoretical and experimental investigations, the technique used should render it certain that all incompetent communicating veins were visualized.

With subsequent operations upon 140 patients being used as a control measure, the certainty amounted to 90 per cent. With repeat phlebography as a control measure, the certainty obtained in 403 diagnosed communicators was 96 per cent.

Disregarding the great and small saphenous veins, a total of 935 incompetent communicating veins were demonstrated. The average figure was 3.4 per leg with varicose veins.

—Hans J. Schweizer, M.D.

The Pathologic Physiology of Pulmonary Embolism, a Physiologic Discussion of the Vascular Reactions Following Pulmonary Arterial Obstruction by Emboli of Varying Size. J. Roger Nelson and John R. Smith. *Am. Heart J.*, 1959, 58: 916.

The authors unravel the confusing experimental and clinical data on the physiopathologic mechanisms of pulmonary embolism. In each of three categories of embolism, that is, in obstructions of the main pulmonary artery by a large embolus, in embolism of medium-sized arteries, and in microembolism of arterioles and capillaries, consideration must be given to the effects of mechanical blockage, to the reflex neurogenic changes in the cardiac and pulmonary circulation, and to the humoral vasomotor effects. In each category the three types of action have been investigated in animals by a variety of methods, in few of which the form of emboli which commonly affects man, the thrombus, has been considered.

The authors think that if large emboli set off the reactions characteristic of the syndrome of pulmonary embolism they may do so by mechanical obstructive effects. However, many reports indicate that simple obstruction of the major pulmonary artery to one lung does not produce the disastrous syndrome seen in man when a thrombotic embolus lodges in a main branch of the pulmonary artery. The evidence would seem to indicate that there are humoral substances arising from the thrombus which cause widespread effects in the lungs and heart. Presumably serotonin is the chief offender.

Similarly embolism of medium-sized vessels by nonthrombotic emboli causes less serious disorder than that due to thrombi, because the latter add humoral mechanisms to simple obstructions.

The circulatory defects caused by microembolism are less well explained. The possibility of neurogenic effects has not been clarified, nor have the humoral mechanisms. Certainly, more than obstruction seems to be at fault. —*Leonard D. Rosenman, M.D.*

Obstruction of the Superior Vena Caval System, an Extensive Review. Joseph J. Ricca. *N. York State J. M.*, 1959, 59: 4171.

William Hunter reported the first case of superior vena caval obstruction in 1757. Since that time, the number of cases in the literature has grown to over 400. Eighty per cent of superior vena caval obstruction occurred in males. The age range in the majority of cases was from 40 to 60 years.

In the past, the majority of cases of obstruction of the superior vena cava have been due to primary neoplasms, chiefly bronchogenic carcinoma, lymphomas, and aortic aneurysms. Other causes of the obstruction have been metastatic carcinoma to the mediastinum, mediastinitis secondary to tuberculosis, syphilis, thrombosis, leukemia, pericarditis, mitral stenosis, pneumothorax, mediastinal emphysema, congenital aneurysms of the superior vena cava, arteriovenous aneurysm, and carcinoma of the thymus. Public health measures have lowered the incidence of obstruction due to aortic aneurysm and tuberculosis. Benign tumors cause obstruction by merely producing an increase in intramediastinal pressure; but primary or metastatic tumors cause obstruction not only by compression but also by direct invasion of the vessel.

Obstruction of the superior vena cava may occur at three sites: (1) above the azygous vein; (2) at the junction of the azygous vein and the superior vena cava; and (3) proximally to the entrance of the azygous vein into the superior vena cava. There are four systems of veins by which blood may be returned to the right side of the heart when there is obstruction of the superior vena cava. These systems are: (1) the azygous route, consisting of the main azygous vein, accessory azygous, ascending lumbar, and lumbar veins; (2) the internal mammary route; (3) the lateral thoracic route; and (4) the vertebral route. In general, with a block above the azygous vein, the venous blood returns from the subclavian vein to the azygous vein by way of tributaries; with a block at the junction of the superior vena cava and the azygous vein or proximal to its entrance, the blood returns by way of collaterals to the inferior vena cava. In each situation there is a reversal of flow in the azygous-hemiazygous system.

In complete obstruction of the superior vena cava there is edema and ruddy cyanosis of the face, neck, thorax, and upper extremities. Dyspnea, cough, and hoarseness may occur. Pharyngeal edema may produce dysphagia. Increased venous pressure in the cerebral veins may produce drowsiness, stupor, and even convulsions. Infrared photographs will intensify the venous patterns of the superficial collateral veins. Measurement of venous pressure, employing various maneuvers, may help to localize the obstruction. Normally, the venous pressure in an antecubital vein decreases on inspiration and increases on expiration while the venous pressure in the femoral vein is just the opposite. When there is superior vena caval obstruction the respiratory fluctuations of the fluid in the manometer in the antecubital vein are similar to those found in the femoral vein. This indicates that the collaterals enter the inferior vena cava and that the level of obstruction is below the entrance of the azygous vein. The circulation time with decholin was found to be prolonged in individuals with caval obstruction. The superior vena caval system with its collaterals can be outlined by phlebography, and the site of the obstruction can be thoroughly demonstrated.

Obstruction of the superior vena cava per se is compatible with long life, and one patient has been reported to be alive 38 years after the onset of the condition. The prognosis is determined by the etiologic factors. If the patient survives 6 months or longer the cause is benign. The specific modes of therapy are surgery, roentgenotherapy, and chemotherapy. Roentgenology and nitrogen mustard therapy may effect a decrease in the size of a compressing tumor or the degree of lymphadenopathy. Various types of grafts may be used to bypass caval obstruction.

—*George R. Holswade, M.D.*

BLOOD; TRANSFUSION

Blood Transfusions and Serum Hepatitis: Use of Monochloroacetate as an Antibacterial Agent in Plasma. J. Garrott Allen, Donald Dawson, Wynn A. Sayman, Eleanor M. Humphreys, and Others. *Ann. Surg.*, 1959, 150: 455.

This article is a study primarily of the relationship of whole blood transfusions to the development of serum hepatitis. The use of a chemical agent as a blood preservative is also studied.

The patients reported on are taken from a population of 11,382 blood transfusion episodes. A 21 per cent sample of this group was chosen for specific study. These patients received blood only. The "transfusion episode" is defined as a period extending from 5 months pretransfusion to 6 months posttransfusion, during which no blood or plasma infusions were given.

The diagnosis of serum hepatitis was considered established when liver biopsy confirmed the clinical findings; or when the clinical pattern did not conflict with the previously established diagnosis. The diagnosis was held in question when conflicting patterns of liver disease were present.

It was found that there was a higher incidence of serum hepatitis when professional donors were used. Prior to 1950, family donors were used almost exclusively. There was an abrupt increase in serum hepatitis when the transition was made. These donors gave a negative history, but they learned how to answer the questions so that their blood would be accepted for a price. Donations by relatives should be encouraged.

The attack rate of serum hepatitis from multiple transfusions is cumulative with each additional unit up to five units. Those patients who require six or more units are frequently naturally excluded because they are included in the group of those who die within 30 days.

One problem is the carrier donor who has not had clinical serum hepatitis. The attack rate appears to be

about 1.06 per cent for one transfusion. It appears that there are some individuals who receive infected blood but in whom serum hepatitis does not develop. No cases of serum hepatitis have been noticed after the use of stored plasma.

The mortality rate from hepatitis that follows blood transfusion is about 14 per cent in patients traced for 11.5 years. The early mortality is about 8 per cent.

The use of the sodium salt of monochloroacetic acid was tested as a preservative for whole blood. It was found to have antibacterial activity and to be essentially nontoxic in experimental animals and in human beings with extensive carcinomatosis. Chemical analysis of sera with the chemical added did not show changes in normal serum constituents. No claim is made for antiviral qualities of the chemical.

Reference is made to the problem of the single transfusion. This brings into focus the necessity of having clear indications for ordering the administration of a single 500 ml. unit of blood. In the series presented, about 36 per cent of patients received a single blood transfusion.

—*Richard L. Lawton, M.D.*

Studies of Edglugate-Mg, a New Donor Blood Anticoagulant-Preservative Mixture for Extracorporeal Circulation. WIRT W. SMITH, IVAN W. BROWN, JR., W. GLENN YOUNG, JR., and W. C. SEALY. *J. Thorac. Cardiovasc. Surg.*, 1959, 38: 573.

THE CLINICAL APPLICATION of extracorporeal circulation brought with it the need for relatively large amounts of heparinized blood freshly drawn from compatible donors. Until it becomes possible to maintain blood outside the body in a condition of normal homeostasis, there is no doubt that heparinized blood freshly drawn from the donor by meticulous technique is the most ideal blood for use in human perfusions.

In order to employ any substitute blood which has been stored even temporarily for this purpose, one must be willing to accept some changes in this blood as inevitable. In these studies the advantages and disadvantages of an anticoagulant-preservative mixture designed as a substitute for fresh heparinized blood are evaluated.

The disadvantages at the end of the 5 day permissible storage period for perfusion are increased plasma potassium content and depression of antihemophilic globulin and factor V levels. In spite of these changes the authors had no recognizable difficulties in 81 perfusion cases employing edglugate-Mg blood stored up to 5 days for priming the extracorporeal apparatus.

Edglugate-Mg consists of 0.41 gm. of sodium EDTA, 0.364 gm. of sodium gluconate, 1.50 gm. of dextrose, and 0.305 gm. of magnesium chloride per 500 c.c. of blood. The technique of heparinization and calcium addition before use is described.

—*W. Foster Montgomery, M.D.*

The Management of Abnormal Bleeding Following Extracorporeal Circulation. HERBERT A. PERKINS, JOHN J. OSBORN, and FRANK GERBODE. *Ann. Int. M.*, 1959, 51: 658.

IN THE EARLY DAYS of artificial heart-lung machines, abnormal postoperative bleeding was common. Nowadays, well established groups with hundreds of clinical cases to their credit claim that abnormal postoperative bleeding is no longer seen. This is undoubtedly a result of the establishment of a successful routine from which no deviation, no matter how minor, is permitted without a careful check of the effect. The authors believe that the hematologic effects of heart-lung bypass vary greatly from one group to the next and even in the same group using the same general technique from one operation to the next.

During the period of extracorporeal bypass there is invariably a drop in the blood platelet count but the platelet counts seldom fall below 90,000 per c. mm. Most of the loss occurs in the first few minutes but there is a slow continuous fall as long as the bypass continues. In general, the platelet count returns to safe levels shortly after the bypass. In animal work it has been demonstrated that dirty equipment or equipment containing pyrogens will result in a marked thrombocytopenia. Thrombocytopenia in a marked degree may develop also as the result of transfusion of excessive amounts of blood containing nonviable platelets. The authors use blood that is less than 24 hours old and is collected in either plastic bags or siliconed bottles. If abnormal bleeding persists and the platelet count remains below 60,000 per c. mm., steroids may be of some help, and blood replacement should be made with absolutely fresh blood in plastic bags or siliconed bottles.

Adequate amounts of heparin should be used. The authors recommend 3,000 units of heparin per kgm. body weight and 25,000 units per 500 ml. of donor blood. Borderline amounts of heparin may result in the deposition of fibrin on foreign surfaces in a layer too thin to be seen, which can lead to a severe depletion of the essential clotting factors. The authors use protamine to neutralize the heparin after the perfusion. The amount of protamine required is determined by a protamine titration with blood taken from the oxygenator at the end of the perfusion. The authors give the full amount of protamine at one time and have had no difficulty with hypotension. They also state that they have never seen heparin rebound.

The authors have seen no abnormal bleeding from fibrinolysis. The protamine titration tubes are left at room temperature for 24 hours so that they may be observed for clot lysis. This phenomenon occurred on only one occasion in a patient with no abnormal postoperative bleeding. However, one must be alert to the possibility of fibrinolysis, and, should it occur, steroids may be tried and fibrinogen should be given if the fibrinogen level is low. In bypasses of more than 2 hours' duration, operative bleeding may result from deficiencies of other plasma coagulation factors. Large amounts of coronary sinus return seem to produce greater abnormalities. Impairment in prothrombin consumption in the first stage of coagulation may be caused by a deficiency of plasma thromboplastic component. Defects of this sort are spontaneously reversible and will respond to the administration of fresh blood during the first 4 to 5 hours after the operation.

Before operation the patient is carefully questioned as to a previous history of abnormal bleeding. If a true bleeding diathesis can be confirmed by laboratory tests, operation is contraindicated. When the

blood sample is drawn for typing and crossmatching, observation of the time it takes the blood to clot gives additional information about the clotting mechanism. If abnormal bleeding occurs after operation, a platelet count and protamine titration are made and treatment is based on the findings. If these are normal and bleeding persists, re-exploration of the wound is indicated. —*George R. Holswade, M.D.*

RETICULOENDOTHELIAL SYSTEM

Incidence of Infection in Children After Splenectomy. BERNARD LASKI and ANGUS MACMILLAN. *Pediatrics*, 1959, 24: 523.

THERE HAVE BEEN several reports in the literature over the past few years which would indicate an increased susceptibility of children to infection after splenectomy. The major cause of severe sepsis has been meningitis, and the most frequent causative organism has been the pneumococcus, although the meningococcus and Hemophilus influenzae have been involved.

This study reviews the records of 81 patients who had a splenectomy and 94 patients who had an appendectomy during the same period of time. The appendectomy cases were chosen at random, but an attempt was made to fit the time and age groups into a comparison with the splenectomized group.

Forty-two per cent of those undergoing splenectomy and 51 per cent of those undergoing appendectomy were followed up for more than 5 years.

There was one instance of serious bacterial infection in both groups of patients, and no statistical comparison could be made.

The cases were separated according to the indication for splenectomy and this indication was compared with the incidence of postoperative infection. It would appear that the most serious infections and the highest incidence were in those patients who had undergone splenectomy for idiopathic thrombocytopenic purpura. These results, however, are not adequate in number for a definite comparison to be made. It is concluded that the incidence of infection does not seem to have a specific relationship to the pre-existing disease. —*John H. Davis, M.D.*

LYMPH GLANDS AND LYMPHATIC VESSELS

Some Devices for the Management of Lymphedema of the Extremities. BROCK E. BRUSH, JOHN H. WYLIE, JR., and JOSEPH BENINSON. *Surg. Clin. N. America*, 1959, 39: 1493.

LYMPHEDEMA OF THE ARM or leg can be treated successfully by the use of two mechanical devices. First, the edema is reduced by the application of external pressure from a pump which supplies intermittent pressure to an encasing sleeve or boot. The period of compression and the amount of pressure applied to the extremity can be varied.

Medication such as diuretics and/or salt restriction may be used as an adjunct. The second phase of the treatment is the wearing of a custom-made pressure-gradient sleeve or stocking.

On the whole a satisfactory treatment requires unusual attention to details by the physician as well as the patient. Of a total of 275 patients treated the results yielded were gratifying. There were no significant complications of treatment. Recurrent lymphangitis has been almost nonexistent.

—*Hans J. Schweizer, M.D.*

SURGICAL TECHNIQUE

ANESTHESIA

The Evaluation of Premedication in Children. ANDREW G. DOUGHTY. *Proc. R. Soc. M.*, Lond., 1959, 52: 823.

THE CURRENT TREND in the choice of premedication for children appears to be shifting from basal narcosis to preoperative sedation. The trend is associated with the increased use of intravenous induction of anesthesia in preference to inhalational methods even in quite young children. The requirement is, therefore, a premedication which will enable a child to be sufficiently co-operative and self-controlled to accept readily the prospect and the experience of an intravenous injection.

A method is presented for the evaluation of preoperative sedation as distinct from basal narcosis. To illustrate the method, observations were made on the behavior of 318 children before and during venipuncture after one of three different premedications: (a) atropine only—by injection (control group); (b) papaveretum-hyoscine—by injection; (c) methylpentynol-hyoscine—by mouth. Three observations were made on each child in the anesthetic room: (a) demeanor up to the time of the injection, (b) change of facial expression in response to the injection, and (c) presence or absence of hand-withdrawal after the injection. A child who showed unsatisfactory behavior in any one of the three tests was classified as unsatisfactory. Those classified as satisfactory showed satisfactory behavior in all three tests.

The results are presented in a form amenable to statistical analysis. According to the criteria defined, methylpentynol-hyoscine appears to be a satisfactory premedication whereas papaveretum-hyoscine shows little advantage over atropine alone. Nevertheless, if different criteria were adopted papaveretum-hyoscine could also be shown to be highly satisfactory. Observations are made on the incidence of respiratory depression associated with papaveretum-hyoscine, and figures are presented showing that postoperative restlessness, crying, and vomiting are related not only to the premedication received but also to the volatile anesthetic agent given.

The author concludes with an analysis of the interpretations which observers of varying bias might place on the figures that have been presented.

—*Mary Frances Poe, M.D.*

The Influence of the Concentration of a Vasoconstrictor on Local Anesthesia. R. W. BUCHERT. *Oral Surg.*, 1959, 12: 1340.

A STUDY of 210 office patients, selected at random, was undertaken to examine the relationship of the concentration of the vasoconstrictor to the efficacy and the duration of local anesthesia. Three concentrations of neocobefrin, a levo isomer of nordefrin, 1:15,000, 1:20,000, and 1:30,000, respectively, were used in combination with propoxycaine hydrochloride, 0.4 per cent, and procaine hydrochloride, 2 per cent. For purposes of comparison, the same local anesthetic solution was also employed with levarterenol 1:30,000 and cobefrin (nordefrin) 1:10,000. The only variable in the five solutions studied was the vasoconstrictor. The solution containing neocobefrin 1:30,000 gave the highest incidence of completely satisfactory anesthesia and the shortest duration and the lowest incidence of systemic reactions. The systemic reactions, all minor, included subjective ones such as palpitation and apprehension.

—*Mary Frances Poe, M.D.*

Single Dose Caudal Anesthesia in Obstetrics. RICHARD P. GOTCHEL and WILLIAM A. WEST. *Obst. Gyn.*, 1959, 14: 652.

THE IDEAL OBSTETRIC ANESTHETIC should be one which provides ease of administration; safety to both mother and baby; complete or near-complete alleviation of pain; and freedom from toxicity, cardiovascular disturbances, and postpartum sequelae. Caudal anesthetics have been utilized in obstetrics for years, administered by the continuous and the single dose techniques. The technique of a single injection with a short needle is an outstanding contribution to modern obstetric anesthesia. A modification of this method was employed in 114 selected patients at The Cooper Hospital, Camden, New Jersey. In most instances chloroprocaine hydrochloride was used.

The patient is examined early in labor and selected for caudal anesthesia if the caudal space is palpated and if the parity is not over III. Premedication usually consists of meperidine hydrochloride 100 mgm., promethazine hydrochloride 50 mgm., and a small dose of a barbiturate, usually 1.5 grains of pentobarbital sodium. Approximately 10 minutes before delivery, when cervical dilatation is usually complete in multiparas and the caput is visible in nulliparas, the patient is placed in the lateral recumbent position and her sacral area and lower back are cleansed with antiseptic solution. After a small amount of the solution is injected into a skin wheal, the 20 gauge needle is inserted at a 45 degree angle to the skin, the point of entry being midway between the cornua sacralia. A definite loss of resistance is noted when the needle passes through the sacrococcygeal ligament. The syringe is then attached to the needle and 0.5 ml. of solution injected to clear the needle. After aspiration to ascertain that the needle is not in a vein or through the dura, 5 ml. of solution are injected slowly, there being little resistance to the flow if the needle is positioned correctly. The expulsive efforts of labor will cease almost immediately if the anesthetic has been deposited in the proper space. If the patient shows no undue reaction such as faintness or dizziness, the remaining solution, a total of 20 ml., is injected. The patient is then turned on her back and prepared for delivery.

Of the 114 selected patients, one group of 48 patients was used to determine the suitable drug and dosage and the second group consisting of 66 patients

received 2 or 3 per cent chloroprocaine hydrochloride. In the latter group, satisfactory anesthesia was obtained in 85 per cent. Two and 3 per cent chloroprocaine were essentially the same in action in the authors' patients.

For selected patients, single-injection short-needle caudal anesthesia closely approaches the ideal.

—Charles Baron, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Continuous Wound Suction. J. N. Barron. *Brit. J. Plast. Surg.*, 1959, 12: 183.

Negative pressure drainage in plastic surgery offers several advantages. It actively encourages evacuation of fluid from all types of wounds and the negative pressure both splints the tissues and encourages firm adhesion between healing surfaces. It therefore takes over the functions both of the pressure dressing and the open drain.

Three years' experience with various forms of suction has left the author with no doubt as to its suitability to plastic surgery. The absence of edema is notable, suture lines and flaps can be inspected, and troublesome immobilization is avoided.

The following simple system has been evolved and appears to work efficiently. The wound tube is either No. 3 or No. 4 polythene tubing, which is split longitudinally. This by experiment has been found to be the most efficient drain. The tube is introduced into the wound in such a way that all parts are drained. A short, tight-fitting rubber cuff is slipped over the tube and passed up to the point where it enters the skin. A separate stab wound is always used. Negative pressure is induced by a collapsible polythene bottle which can be obtained cheaply. The screw cap of the bottle is drilled and a flanged empyema tube with the flange trimmed to fit the internal diameter of the cap is passed through the drill hole. The free end of the empyema tube is connected to the drainage tube by means of a suitable-sized mixing needle or cannula. To obtain suction, the bottle is tightly compressed, the tube is linked up, and the negative pressure is distributed to the wound. Measurements show that 70 mm. Hg suction can easily be obtained.

The author recommends negative pressure drainage as a substitute for pressure dressings and open drains, and adds that much can be learned about the postoperative behavior of wounds because of the ease of observation and measurement of the exudate.

—Frank W. Pirruccello, M.D.

Technique with Parallel Flow, Straight Tube Blood Dialyzer. Arthur E. MacNeill, John E. Doyle, Roland Anthone, and Sidney Anthone. *N. York State J. M.*, 1959, 59: 4137.

In the majority of instances the apparatus necessary for an effective extracorporeal circuit has been rather large and expensive and has required a well-equipped, fixed installation. The authors report the details of construction and operation of their simplified and portable clinical dialyzing equipment which opens the way to the initiation of dialysis services in small hospitals.

Since early 1954, clinical models of their blood dialyzer have been in regular use. According to the authors this equipment exhibits the following valuable features: (1) parallel blood flow as seen in the capillaries, with low resistance to blood flow; (2) sterilization by autoclaving; (3) small capacity of blood (no need for blood priming); (4) adequate dialyzing surface, with high efficiency; (5) optimal blood flows with low blood pressures; (6) wide overall margin of safety; (7) simplicity not only in design but also in assembly, and ease of maintenance; (8) rigid support of the cellophane membrane within a closed system providing the means for ultrafiltration; (9) flexibility in the volume and composition of the dialyzing fluid so that variable modes of chemical and thermal treatment are possible; and (10) economy of personnel and operating materials.

One great advantage of the apparatus is that it can be employed in a vein-to-vein circuit. By this method blood is withdrawn from a saphenous vein and is returned through an antecubital vein.

The design of this dialyzer resembles the arrangement of the natural capillary system. Such a synthetic capillary mechanism may eventually be used in the performance of functions of vascularized organs other than the kidney. The practicability of using this dialyzer and pump, without blood priming, opens the way to more meaningful basic physiologic studies.

The efficacy of the apparatus, which is available in three standard sizes, is expressed in terms of urea clearance and total urea removed.

—Harold Laufman, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Simultaneous Biplane Large-Film Serialography in Cerebral Angiography. HAROLD G. JACOBSON and JEROME H. SHAPIRO. *Am. J. Roentg.*, 1959, 82: 773.

THE ADAPTATION of a biplane film changer originally designed for catheter angiocardiography for use in cerebral angiography is described by the authors. The equipment includes two 500 ma. generators and 14 by 14 in. cut film is used. The changers are capable of up to 30 exposures in each of two planes simultaneously and films may be exposed as slowly as three films per 2 seconds or as rapidly as six films per second. The technical factors are described by the authors and examples of roentgenographic exposures made in both planes are presented.

Until shortly before this report was made, a hand syringe was used for the percutaneous injection of the opaque material; but the authors indicate that they are now investigating the use of a high pressure automatic syringe which is also used in selective catheter angiocardiography. They indicate that there may be considerable advantage to the use of the automatic injector both because of better exposure of the roentgenograms and because the operator avoids all radiation exposure during the procedure.

The advantages of the biplane unit are as follows: (1) scout roentgenograms are easily obtained; (2) only one injection of opaque material is necessary; (3) positioning of the patient on the special mobile table is very simple and reproductions of positions are therefore easier; (4) the use of large cut film permits examination of larger areas without unduly increasing the amount of exposure to patients or the amount of opaque material; (5) there is great flexibility in the timing of exposures; (6) simultaneously exposed biplane roentgenograms are viewed; (7) there is some magnification of small vessels due to distortion but without significant loss of detail; (8) the examination time is considerably shortened; and (9) cut film is more easily processed and viewed than is roll film.

The authors do not believe the disadvantages are of any real consequence. —*Moris Horwitz, M.D.*

A New Method of Radiographic Exophthalmometry. B. W. A. LEEMING. *Brit. J. Radiol.*, 1959, 32: 539.

AN EASILY REPRODUCIBLE METHOD of measuring the degree of exophthalmos by radiography is described. The method is believed to be more reliable than others previously described, in that it measures the actual forward protrusion of the eyeball in the socket and its regression.

Illustrations and description of the necessary equipment show that it involves a headrest to support the head in a true lateral position, with a slot in the headrest to support a film angled 22.5 degrees toward the sagittal plane. This is the same angle as the orbital axis and, if the x-ray beam is centered at right angles to the film and through the midpoint of the axis, a magnified but otherwise undistorted image of the orbit is obtained. This technique is such that the cornea of the uppermost eye (the one being measured) is thrown clear of the shadows of the bones of the face and can be easily identified with proper radiographic exposure. Accessories to the equipment include devices to hold the head in the same position to insure accurate follow-up measurements and a millimeter-pitched screw which can be placed in the plane of the orbital axis so that its image also falls on the film.

Experimentally it was shown that quite large errors of positioning produced little error in the result because of the geometry of the system. The largest errors resulted when the orbit was turned toward or away from the x-ray tube. The author states that this is the most easily avoidable error in positioning.

The accuracy of the method was demonstrated by two examinations of each of 10 normal subjects—a close correspondence of measurement in each pair was obtained.

The method assumes that the eye always moves along the orbital axis, which is not necessarily true. A geometrical analysis shows that even if the eye moved in a parasagittal direction the error involved would be only 7.5 per cent of the estimated figure. In practice the eye moves in some direction intermediate between 0 and 22.5 degrees in the sagittal plane and the error is less than 7.5 per cent.

—*Flora Brown Wurtz, M.D.*

Angiocardiography with Hypaque-M, 90 Per Cent. WILLIAM T. MESZAROS, WILLIAM B. BUCKINGHAM, GEORGE C. SUTTON, and GEORGE W. HOLMES. *Dis. Chest*, 1959, 36: 642.

THE IDEAL ANGIOCARDIOGRAPHIC CONTRAST MEDIUM should be capable of producing good visualization of both right and left cardiac chambers and great vessels, and should be free of serious toxic reactions. In children both right and left cardiac chambers are readily visualized. Visualization of the left cardiac chambers and aorta remains a difficult problem in adults. The hypaque used in this study was hypaque-M, 90 per cent, a mixture of the sodium and n-methylglucamine salts of diatrizoic acid.

This is a report of 105 consecutive angiocardiograms, using 90 per cent hypaque made at the Cook County Hospital in Chicago, Illinois. The study included 67 adults and 38 children. The amount of hypaque used in adults was usually 50 c.c. In 12 cases a larger amount (from 60 to 80 c.c.) was injected, and in 6 cases a smaller amount (20 to 35 c.c.). The site of injection was peripheral in 34 and central in 33 cases.

There were no fatal or serious reactions in the entire series. Most patients had no reaction whatsoever to 90 per cent hypaque. A slight sense of heat was noted by 18 patients and coughing occurred in 5. Vomiting, nausea, headache, and insulin reaction were each noted once. There was no relation between the dosage of hypaque and the observed reactions.

The total incidence of mild reactions was 26.6 per cent. The angiocardiograms were of excellent diagnostic quality in all pediatric patients. In 67 adults, good visualization of the left side of the heart was obtained with equal frequency after either central or peripheral injection. Thus, 90 per cent hypaque proved to be a safe and successful angiocardiographic contrast medium. After the completion of the initial study, 90 per cent hypaque was used in more than 300 additional angiographic examinations, with similar experience as to quality of visualization and infrequency of reactions. —*Robert A. Nabatoff, M.D.*

Left Ventricular Angiocardiography in the Diagnosis of Persistent Atrioventricular Canal and Related Anomalies. EUGENE BRAUNWALD, ANDREW G. MORROW, and THEODORE COOPER. *Am. J. Card.*, 1959, 4: 802.

IN STUDYING PATIENTS with atrial or ventricular septal defects, if the clinical findings and those of catheterization are atypical or equivocal, the presence of a more complex anomaly must be suspected. The technique used for left ventricular angiocardiography depends upon whether or not there is an interatrial septal defect. If the atrial defect is present the catheter can be passed through it into the left ventricle, whereas if the septum is intact the catheter can be passed through the aortic valve and into the ventricle from the femoral or right radial artery. Urokon 70 per cent was used and the dosage was 1 to 1.2 c.c./kgm. of body weight. Biplane films were exposed at a rate of 4 to 6 per second.

Cases of atrial septal defect of the usual type, incomplete persistent atrioventricular canal, complete form of persistent atrioventricular canal, ventricular septal defect of the usual type, and combined atrial and ventricular septal defect are reported. Of the 5 cases in which operation was performed following this study the defects diagnosed were found and repaired. Further use of this additional method for preoperative diagnosis is worthy of consideration.

—*Gabriel P. Seley, M.D.*

Selective Angiocinematography During Cardiac Catheterization (Zur kinematographischen Darstellung der selektiven Herz- und Lungenangiographie). GÜNTHER M. DUMMER. *Thoraxchirurgie*, 1959, 7: 287.

IN THIS SHORT REPORT the author discusses angiocinematography of selected segments of the pulmonary circulation and of the cardiac chambers, performed in combination with the usual studies in cardiac catheterization, including determination of pressures in the heart and pulmonary artery and blood gas analysis. These studies can all be completed during the same session.

Accurate determination of the duration of arterial, capillary, and venous filling phases in the lung by means of angiocinematography is of value in, among other things, assessing the degree of pulmonary arterial sclerosis secondary to the existing heart disease. Local abnormalities of the pulmonary circulation, as in irreversible atelectasis, may be shown. Diagnostic information may be obtained from cinematographic records of the selective filling of the chambers of the heart.

The operating table used for cardiac catheterization by the author has a roentgen ray tube underneath, and fluoroscope screen above the patient, both movable along the entire length of the patient. The use of an image intensifier permits the roentgen ray doses to be held as low as 0.9 to 1.5 r/min. to the skin of the patient during fluoroscopy, and 5 mr/picture during angiocinematography. The catheterization team as well as the patient are protected from scatter by adequate lead shields.

A 35 mm. reflex camera is used in conjunction with the image intensifier for cinematography. In this camera, the film can be advanced at speeds variable from 6 to 48 frames/sec. At a rate of 24 frames/sec., the camera magazine provides for 120 seconds of photography. The sequence of events within the circulation can be timed exactly from the exposed frames.

The same apparatus can be used for obtaining cinematographic records in salpingography, bronchography, and pyelography. The author has found this equipment a valuable diagnostic aid during the year in which he used it. —*Elmer V. Dahl, M.D.*

Roentgenologic Evaluation of Mesenteric Small Intestinal Obstruction. ROBERT D. SLOAN. *Am. J. Roentg.*, 1959, 82: 978.

IN AN ATTEMPT to evaluate the accuracy of interpretation of abdominal films in the diagnosis of obstruction of the mesenteric small intestine, an unselected group of 400 examinations on 323 patients was reviewed by the author. The examinations consisted of a film made with the patient supine and one taken with the patient in either the erect or decubitus position. On the basis of study of the films without knowledge of clinical information, the cases were divided into 5 categories: (1) no evidence of obstruction; (2) intermediate evidence of obstruction; (3) mechanical obstruction; (4) adynamic obstruction, paralytic; and (5) obstruction of mixed or uncertain type.

At a later date the films were again read blindly by the same reader.

The official roentgenographic reports made at the time the patients were examined were then separated according to the five classifications. Finally the overall clinical evaluation was used as the standard against which roentgenographic interpretations were compared.

The results indicate that the method is reasonably accurate and that even in the absence of clinical information a correct evaluation can be made in many instances. The range of error is comparable to that reported in studies of the detection and evaluation of intrathoracic disease. —*Lois Cowan Collins, M.D.*

Observations on the Small Bowel Pattern Associated with the Zollinger-Ellison Syndrome. JOHN M. WEBER, SAMUEL LEWIS, and KENNETH H. HEASLEY. *Am. J. Roentg.*, 1959, 82: 973.

OF THE CASES OF Zollinger-Ellison syndrome reported in the literature diarrhea has been an early symptom in one-third.

Three cases of the syndrome are reported, in all of which diarrhea was an early and persistent symptom.

In all 3 cases the roentgenographic pattern of the small intestines was similar. The mucosal folds were very wide and a thin line of barium in the jejunum presented a "lacy" or cobweblike appearance. In 2 patients regional ileitis was suspected, and in 1 there was thought to be obstruction in the third part of the duodenum. In the 2 cases of the syndrome reported in the literature in which roentgenograms of the small intestines were reproduced, a similar appearance was observed.

A review of roentgenograms of the small intestines of patients with a variety of conditions, including sprue, regional enteritis, chronic pancreatitis, diarrhea due to diabetic neuropathy, malabsorption due to radiation, and "deficiency patterns" due to electrolyte or nutritional disturbances, as well as hundreds of cases of duodenal or jejunal ulceration, did not reveal a similar pattern.

It is therefore suggested that the roentgenographic pattern described may be a useful early diagnostic sign. —*Lois Cowan Collins, M.D.*

The Value of Re-examination in Patients with Inadequate Visualization of the Gallbladder Following a Single Dose of Telepaque. HAROLD D. ROSENBAUM. *Am. J. Roentg.*, 1959, 82: 1011.

IN 1954 the author's attention was drawn to 2 patients in whom no gallbladder shadow could be seen on the morning after the administration of iopanoic acid (telepaque) but was clearly visualized the next day during a second roentgen examination. Because of this observation additional tablets of telepaque were given to all patients who showed nonvisualization or inadequate visualization without evidence of gallstones and the examination was repeated on the following day.

This report resulted from a study of 450 patients examined consecutively in this manner in 1955 and 1956. Sixty-six patients with nonvisualization or inadequate visualization were examined a second time. It was discovered that in 9.8 per cent of individuals with initial nonvisualization the findings were normal on the repeat study, while 64.0 per cent of the patients with originally inadequate visualization were eventually adjudged to have normal gallbladder function. It is concluded that nonvisualization or inadequate visualization of the gallbladder after a routine single dose of telepaque cannot be considered conclusive evidence of disease of the biliary tract without confirmation of the finding by a repeat examination, preferably on the following day, or if delayed, after a double dose of telepaque.

—*Frank L. Hussey, M.D.*

X-Ray Diagnosis of Bile Duct Calculi. E. SALZMAN, R. P. SPURCK, and D. H. WATKINS. *Gastroenterology*, 1959, 37: 587.

IN EXPLORING the possible advantages of prolonged administration of telepaque in patients whose gallbladders could not be visualized or were visualized only faintly after conventional cholecystograms, the authors observed that certain radiolucent biliary calculi became roentgenographically opaque. This procedure has been called "biliary calculography," and the stones having this quality, "opacifying gallstones." The gallstone opacification reaction has been reported by Theander in a case of cholelithiasis which was not proved surgically. The authors reported surgically proved cases of opacifying gallstones with experimental reproduction of the phenomenon.

A 4 day telepaque test has been used by the authors. The method consists of giving the patient 3 gm. of telepaque per day, 1 gm. after each meal, for 4 days. A low fat diet is observed. The roentgen examination is made on the morning of the fifth day. In general, the test is well tolerated; diarrhea in some patients is controlled with paregoric.

In a series of 120 patients examined with the 4 day telepaque test, there were 13 pathologically proved cases of bile duct stones. In 10 of these 13 patients there were opacifying stones in the bile ducts. In several instances of opacifying bile duct stones, the ducts could not be visualized by intravenous cholangiography at the time of the completion of the 4 day telepaque test. Only a minority (10 of 76 cases) of gallbladder stones were opacified by the test. Bile duct stones were opacified in cases of slight jaundice (bilirubin level, 1 to 2.5 mgm./100 ml.) and of moderate jaundice (bilirubin level, 2.5 to 5 mgm./100 ml.). Duct stones failed to opacify in cases of marked jaundice and when the stones were of the nonopacifying type.

Although additional experience is needed for definitive conclusions, it is apparent that the 4 day telepaque test is a useful method for identifying bile duct stones. Bile duct stones have been identified in patients with intact gallbladders and also in patients whose gallbladders have been removed. The test has also been useful in positively identifying duct stones suspected on T tube cholangiography. The test is probably the best method available for demonstrating bile duct stones in cases of jaundice, in which intravenous cholangiography usually fails. The authors have observed striking demonstration of opacified intrahepatic duct stones with this method, suggesting that the 4 day telepaque test may be the best method for demonstrating intrahepatic biliary calculi.

—*Frank L. Hussey, M.D.*

Heterotopic Biligrafin Excretion and Liver Function (Heterotope Biligrafinausscheidung und Leberfunktion). R. WILDHACK and H. BOHLIG. *Fortsch. Roentgenstrahl.*, 1959, 91: 622.

IN AN EFFORT to clarify the relationship between liver function and biligrafin excretion through the kidneys in cholangiography, the present study was carried out. A total of 231 patients was studied (134 females, 97 males). Eighty-four patients received 20 c.c. and 155 received 40 c.c. of biligrafin.

It was found that a dose of 20 c.c. of biligrafin resulted in demonstrable excretion by the liver less frequently than a 40 c.c. dose. In only a few cases renal excretion was noted with 20 c.c., whereas with 40 c.c. the kidney was frequently visualized, particularly within 2 hours.

Females showed a frequency of early renal excretion of 21.5 per cent as compared to 9.2 per cent in males. Negative or doubtful excretion by the liver with nonfilling or early filling kidneys became more frequent as the ages of the patients increased. There

was an increase of early renal filling in the overweight patients. In the underweight individuals there was an increase in late renal filling. These findings were thought to be related to liver disease more than to weight.

The relationship of bromsulphalein retention to liver excretion was studied. Liver excretion was rare with bromsulphalein retention of over 25 per cent and present in practically every case of less than 20 per cent. The higher the bromsulphalein retention the greater was the proportion of patients showing renal excretion.

The authors conclude that failure of the liver to excrete biligrafin after a 40 c.c. dose indicates the need for further liver function studies, and that a disturbance of the liver function should be strongly suspected in all cases of late renal excretion of the dye.

—*Max L. Smith, M.D.*

Venography in Fractures of the Femoral Neck. SVEN DAHLGREN. *Acta chir. scand.*, 1959, 117: 494.

SINCE there is a long-felt need for a method by which one can determine the viability of the head of the femur early in the course of treatment of medial fracture of the femoral neck, the author has adopted the method of intraosseous venography described by Hulth in 1953. It has been performed as a routine procedure on patients with fractures of the femoral neck who were admitted to the hospital in Falun, Sweden. Two important technical details are stressed: (1) The patient should be kept in extension for 3 days prior to the performance of the procedure, since otherwise the contrast material may easily leak into the fracture at the time of examination, and (2) the obturator foramen must be included on the roentgenogram in order that a contrast-filled obturator vein may be seen.

Of the 72 patients who have been examined, 25 were followed up after venography. All those in whom contrast-filled vessels leaving the femoral head were not visible at the time of examination, subsequently sustained manifestations of necrosis of the femoral head. Necrosis also developed in 1 of 9 patients with contrast-filled vessels.

Intraosseous venography, which is carried out at the same time the fracture is nailed, is of value in assessing the prognosis of fractures of the femoral neck.

—*Hans J. Schweizer, M.D.*

MISCELLANEOUS

Cause of Death in Cardioangiography. RAYMOND C. READ. *J. Thorac. Cardiovasc. Surg.*, 1959, 38: 685.

WHEREAS a detailed survey by Pendergrass *et al.* revealed that the mortality in intravenous pyelography is 1 in 150,000 cases, Diamond and Gonlubol found that in intravenous cardioangiography it is 2 to 5 per cent or approximately ten thousand times greater. The author has undertaken a series of experiments in dogs to determine the cause and mechanism of those fatalities.

The experiments were divided into three categories: (1) open chest animals (44 injections in 16 dogs); (2) isolated perfused lung (16 lungs); and (3) total body perfusion (8 experiments). The techniques used and the various responses to the injection of the different opaque media are detailed at length.

The conclusion is reached that rapid injection of 1 to 3 ml./kgm. of concentrated opaque medium into the venous system unequivocally lowers peripheral resistance. This effect, combined with the changes in pulse pressure, pulse wave, plethysmographic tracing, and skin temperature, together with the microscopic findings, confirms the vasodilatory nature of these compounds shared with other hypertonic solutions. This effect is delayed after intravenous injection because it depends upon direct contact with the peripheral vasculature. The elevation in pulmonary artery pressure, venous pressure, and heart rate observed at this time indicates a compensatory adrenergic release. Solutions having an osmotic activity greater than 1,500 milliosmols per liter sometimes resulted in death from acute cor pulmonale due to the pulmonary hypertension produced. Studies of the isolated perfused lung showed that the increase in pulmonary vascular resistance was related to the presence of red blood cells in the perfusate and additional microscopic studies revealed that these compounds can cause red blood cell agglutination which is responsible for the pulmonary effects.

It is pointed out that the risk of agglutination may be markedly reduced, if not eliminated, by altering the characteristics of the more concentrated radiopaque preparations. An attempt should be made to limit their osmotic activity to less than 1,500 milliosmols per liter by either decreasing their solubility or increasing their molecular size, or—a more difficult task—by raising their permeability so high that they could not develop an osmotic differential across the red cell membrane.

—*T. Leucutia, M.D.*

Treatment of Malignant Pelvic Tumors by Extracorporeal Perfusion with Chemotherapeutic Agents. W. GERALD AUSTEN, ANTHONY P. MONACO, GEORGE S. RICHARDSON, WILLIAM H. BAKER, and Others. *New England J. M.*, 1959, 261: 1037.

CREECH AND HIS ASSOCIATES, in 1957, introduced a perfusion method with chemotherapeutic agents, utilizing an extracorporeal circuit. By this method, the circulation of a region bearing a tumor is isolated and perfused, permitting the administration of high doses of the agent to the tumor and its immediate surroundings with minimized systemic toxicity. An oxygenator was also incorporated into the extracorporeal circuit to produce high oxygen tensions of the tissues during the perfusion.

The authors applied the extracorporeal perfusion with nitrogen mustard to malignant tumors within the pelvis.

Vascular isolation of the anatomic pelvis is achieved by occlusion of the aorta and vena cava by suitable noncrushing vascular clamps, and of the femoral vessels by pneumatic cuffs inflated around each upper thigh. Exposure of the aorta and vena cava is accomplished through a transabdominal or preferably retroperitoneal approach. The femoral vessels are exposed in the thigh proximal to the pneumatic cuff. The perfusion is carried out through No. 14 plastic cannulas inserted into the femoral artery and vein and threaded cephalad into the external iliac vessels. In

general, the pelvic perfusion is carried out at a pressure of 70 mm. Hg and a flow rate of 500 ml./min. Maintenance of the perfusion pressure at a lower level than the systemic pressure minimizes the loss of the chemotherapeutic agent to the general circulation through the unoccluded collateral channels.

The extent of mixing of the perfusate with the general circulation is variable and not accurately predictable. To determine the rate of mixing of the two circulations, an aliquot of red cells labeled with radioactive chromate is added to the perfusate at the beginning of perfusion and serial samples from both circulations are taken. The usual rate of mixing is approximately 1.5 per cent per minute in which case 1.0 mgm./kgm. of body weight of nitrogen mustard may be safely given. If the mixing rate is 3 per cent per minute the dose is reduced to 0.8 mgm./kgm. and if it is 4 per cent per minute to 0.4 to 0.5 mgm./kgm.

Of the 7 patients treated, 4 showed encouraging palliation with regression of the malignant process. The longest postoperative follow-up period extends to 4 months. —*T. Leucutia, M.D.*

Treatment of Kaposi's Sarcoma of the Lower Extremity by Extracorporeal Perfusion with Chemotherapeutic Agents. ANTHONY P. MONACO and W. GERALD AUSTEN. *N. England J. M.*, 1959, 261: 1045.

THE AUTHORS treated 2 patients with Kaposi's sarcoma of the lower extremity by extracorporeal perfusion with nitrogen mustard.

Lesions below the knee can be perfused through the vessels of the adductor canal; lesions above the knee require cannulation of the common femoral artery and vein and occasionally of the external iliac vessels. The suitable vessels are exposed. The patient is prepared with 2 mgm. per kgm. of body weight of heparin and the artery and vein are cannulated. For perfusion of the vessels of the adductor canal a pneumatic cuff is inflated around the upper thigh. For perfusions of the common femoral and external iliac vessels venous occlusion is achieved by a tourniquet placed just above the inguinal ligament and gluteal crease, secured tightly over a Steinmann pin driven into the anterosuperior spine.

The perfusion pressure is 70 mm. Hg, with flow rates of 350 ml./min. for the adductor canal vessels, 400 ml./min. for the common femoral artery, and 450 ml./min. for the external iliac artery for periods up to 60 minutes.

The extent of loss to the general circulation is determined in the same manner as described in the preceding article. In general, perfusion of the vessels of the adductor canal is accomplished with practically no loss to the general circulation, except for a 2 per cent loss in 40 minutes through the bone marrow vessels. Perfusion of the common femoral and external iliac vessels may result in up to 10 per cent and 25 per cent losses, respectively.

The dosage of nitrogen mustard is 0.6 mgm./kgm. of body weight in perfusion of adductor canal vessels and 0.8 to 1.0 mgm./kgm. of body weight in perfusions of the common femoral and external iliac arteries.

The 2 cases of Kaposi's sarcoma, in which the method was used, are reported in detail. In both cases there was prompt regression of the lesions, without local sequelae or systemic toxicity. In the first case the area of treatment has remained controlled for 10 months, but 8 months after perfusion multiple lesions developed on the thigh above the level of the tourniquet, which then were successfully treated by external irradiation. In the second case, a large recurrence appeared after 6 months at the site of the previously healed tumor with extension to the inguinal lymph nodes, eventually necessitating amputation and groin dissection. —*T. Leucutia, M.D.*

Our Present Exposure to Radiation (Unsere derzeitige Strahlenbelastung). H. KIEFER and R. MAUSHART. *Medizinische*, 1959, p. 1521.

THE AUTHORS make an attempt to demonstrate by means of figures the influence upon man of the various sources of radiation to which he is exposed in his environment. The effects of radiation of natural origin are no different than those of artificial radiation. Radiation from natural sources, however, varies in intensity in different areas of the globe. The radiation from natural sources is subdivided into: (a) extracorporeal sources, represented by the cosmic rays, radioactive minerals, radioactive dust, and gases; and (b) corporeal sources, represented by the isotopes K^{40} and C^{14}, which are minute fractions of the body potassium and carbon. Included are the isotopes, such as radium and thorium, and their disintegration products picked up from the environment.

The cosmic rays are responsible for about one quarter of the natural radiation and the intensity of exposure to them depends on the altitude and the latitude. The dosage varies from 35 to 500 mrem/year, 1 rem being the amount of radiation from any source absorbed by the human body equal to the amount of radiation absorbed when exposed to 1 roentgen from a 250 kilowatt source. The radiation from the air and the soil originates from uranium, thorium, and disintegration products of K^{40} and varies with the concentration of these substances. In the region of Kerala, India, which is rich in monazite, the radiation amounts to 2,000 mrem/year. Persons living in regions that are covered most of the time by ice and snow, or those who spend long periods on the open ocean have a minimal exposure. The exposure in buildings depends on the material of which they are made; they also protect individuals from external radiation. The concentrations of radon and thorium in the air are generally small and contribute little to the total dose; however, their effects on the respiratory system vary because of the byproducts of the radioactive gases.

The natural radioisotopes in the body proper are the carbon isotope C^{14} and the potassium isotope K^{40}. They are normal constituents of the body and their concentration varies with the age and weight. The radium ingested with water and food is deposited in the bones. The daily intake of radium from food is estimated as 1.6×10^{-12} gm.; the intake from drinking water becomes of importance only when the radium content in water is higher than 10^{-15} gm./c.c. Since 50 to 70 per cent of the radon formed is eliminated from the radium deposits by diffusion, the dosage received by the bone marrow is evaluated at 50 mrem/

year and that of the bone at 38 mrem/year. The radon concentration in the air near the ground is about 10^{-10} c.c. and in closed rooms 10^{-9} c.c. The radon disintegration products which are inhaled and deposited on aerosoles are in part retained in the respiratory tract and this leads to a radiation dosage in the lung of 25 to 250 mrem/year. Considering that the lung is also exposed to all the previously mentioned sources, the lung becomes the organ with the highest radiation exposure. The dosage to the bones and gonads varies with sex and body position during the exposure.

Consideration of the exposure to radiation from artificial sources involves first the determination of "doses of tolerance," which have to be higher than the doses from natural sources. From the viewpoint of genetics the maximal dosage, considering all the known experimental and statistical data for large populated areas, is 14 million rem/million persons over a 30 year period. How much of this leeway of one-third rem/person/year is consumed by the exposure to radiation sources such as roentgen rays, luminescent watches, and atomic bomb fallout? The medical employment of roentgen rays and radioisotopes forms a large source of exposure to artificially produced radiation. The diagnostic use of roentgen rays forms 75 to 90 per cent of the total with a 7 per cent gonadal involvement. The therapeutic use of radiation involves mostly persons who are beyond the reproductive age. The radioisotopes most frequently employed are I^{131} and P^{32}. The large amount of radioactive gold can be disregarded somewhat since it, like radium, is used mostly for palliation. The exposure of professional personnel to roentgen rays amounts to 500 to 5,000 mrem/year/profession. The exposure to radium can amount to more than 100 mrem/week.

The amount of exposure from atomic bomb fallout is of maximal importance. With the explosion of an atomic bomb of the megaton class many radioactive isotopes are formed, of which a greater or lesser amount, depending upon the type of bomb and the altitude of the explosion, fall on the ground over a period of days or weeks while the rest reaches the stratosphere. Here a homogeneous dispersion occurs and a slow fallout over many years takes place. The external radiation from finely dispersed particles is unimportant. The fission products which reach the ground, mainly Cs^{137} which has a long half-life, result in a gonadal dosage of 4 (Japanese data) or 1 to 6 (American data) mrem/year. Of great importance is the ingestion of these products in food and water. Here Cs^{137} and Sr^{90} are of great importance since they are easily assimilated by the body because of their chemical relation to potassium and calcium. Cesium is distributed equally throughout the body while Sr^{90} and its daughter Y^{90} are deposited almost exclusively in the bones and can contribute to the formation of sarcomas and leukemias. This fact is of great importance in children since they will accumulate Sr^{90} in their bones throughout their entire development.

Other sources of radiation, which are frequently discussed, are luminescent watches, the use of roentgen rays in fitting shoes, and television sets. The leeway between natural and artificially produced radiation has today decreased by one quarter. The exposure from medical use should not increase because better shielding devices are being developed. The amount due to industrial exposure and that due to fallout, after further explosions are stopped, will increase in the future. In summary it has been concluded that the exposure to radiation in the culturally more developed countries has doubled and that the half-way mark of what is today considered the limit for radiation exposure for large populated areas has been reached. —*Hellmut Mattheis, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Pathophysiologic Changes with Extracorporeal Circulation. Gas Exchange and Acid-Base Balance (Pathophysiologische Veraenderungen bei Anwendung des extrakorporalen Kreislaufs. Gasstoffwechsel und Saeuren-Basengleichgewicht). R. BEER, G. LOESCHCKE, H. GEHL, H. G. BORST, and M. SCHMIDT-MENDE. *Langenbecks Arch. klin. Chir.*, 1959, 291: 443.

THE OPERATIVE RISK in open heart surgery using a mechanical bypass depends in part on the maintenance of adequate physiologic function, including the delivery of oxygen to the tissues and the acid-base equilibrium, both of which are vital to normal cell metabolism. In a series of experiments using dogs perfused for 30 to 40 minutes with either a Lillehei-DeWall or a Kay-Gaertner oxygenator, the authors investigated the gas exchange and the acid-base balance to determine the causes of disturbance and the means for avoiding them.

Measurement of oxygen uptake and CO_2 release with various perfusion volumes per unit of time indicated that the total oxygen uptake was normal if the partial pressure of oxygen in mixed venous blood did not fall below 32 mm. Hg. A perfusion volume equivalent to 35 per cent of the normal cardiac minute output was adequate to keep the venous oxygen content above that level. Venous oxygen tension rises only very slightly at higher perfusion rates; the curve relating venous oxygen tension to perfusion rate is exponential.

A normal total oxygen uptake, however, does not necessarily indicate that the metabolic requirements of each individual vital organ are satisfied. Cerebral blood flow decreases abruptly, in near linear fashion, with a fall in mean arterial pressure or with a reduction in arterial CO_2 content. Experiments during which the superior sagittal sinus was cannulated and gas analysis was performed on venous cerebral blood before, during, and after extracorporeal perfusion yielded data indicating that, with perfusion at 50 per cent of the normal cardiac output per minute and with no CO_2 added to the oxygen in the oxygenator, oxygen requirements of the brain were not fulfilled. During perfusion at that rate, oxygen partial pressure in cerebral venous blood fell to 25 mm. Hg, a level at which reversible functional cerebral disturbances are expected. Perfusion of the brain under those conditions approximated 55 per cent of normal. To assure adequate cerebral blood flow, mean arterial pressure must be kept at 70 mm. Hg or higher, and arterial CO_2 tension must be normal.

All previous investigators agree that during extracorporeal circulation the *p*H and CO_2 content of the blood fall. A deficit in alkali reserve of from 4 to 8 mm. of CO_2 per liter develops. Extracorporeal circulation per se does not lead to this metabolic acidosis. The deficit in alkali reserve is smaller when high perfusion rates prevail. The following are listed as causes for the acidosis which may arise during perfusion by a heart-lung machine: (a) accumulation of acid metabolic products during hypoxia, especially when perfusion falls below 35 per cent of the normal cardiac minute output; (b) liberation of fixed acids, especially lactic acid, during periods of hypotension; (c) accumulation of acid metabolites due to anesthesia and thoracotomy; (d) accumulation of acid anions after an induced respiratory alkalosis; and (e) acidosis in the transfused blood, due to glycolysis in storage. The alkali reserve in blood for transfusion falls by 1.7 volumes per cent CO_2 per hour during storage at 20 degrees C. At 38 degrees C., as in the pump oxygenator, this fall is 4 volumes per cent per hour. In their experiments the authors found that the entire fall in alkali reserve which took place during extracorporeal circulation was accounted for by its deficit in transfused blood.

These causes of acidosis can all be either avoided or neutralized by higher perfusion rates, avoidance of hyperventilation, storage of blood for transfusion at 4 degrees C. until immediately before use, and correction of any alkali deficit by the administration of sodium bicarbonate. —*Elmer V. Dahl, M.D.*

Pathophysiologic Changes with Extracorporeal Circulation. Hemodynamic Changes (Pathophysiologische Veraenderungen bei Anwendung eines extrakorporalen Kreislaufs. Haemodynamik). H. G. BORST, R. BEER, H. GEHL, G. LOESCHCKE, and M. SCHMIDT-MENDE. *Langenbecks Arch. klin. Chir.*, 1959, 291: 467.

THE BODY loses a number of vital regulatory functions when a machine is substituted for the heart and lesser circulation. Blood flow is no longer adjusted automatically to the needs of the organism, and the minute volume delivered by the arterial pump must be adjusted to provide adequate oxygen to the tissues. Venous outflow must be maintained so that venous pressure remains normal. The patient's circulation is in part passive, but in part it adjusts actively by vasomotor reactions to the conditions imposed by the machine.

In a series of studies on dogs, using both the Lillehei-DeWall pump-oxygenator and the Kay-Gaertner film oxygenator, the authors investigated the arterial blood pressure, the central venous pressure, and the blood volume before, during, and after extracorporeal circulation. Arterial blood pressure and perfusion volume are exponentially related. Even with perfusion rates set at 100 per cent of normal, the mean arterial pressure is below normal, which is explained by a decrease in arteriolar resistance during extracorporeal circulation. The authors consider a mean arterial pressure of 70 mm. Hg adequate. This pressure can be maintained by a perfusion volume equal to 60 to 75 per cent of the normal cardiac minute volume. Increasing the perfusion volume to above 75 per cent of the normal cardiac minute volume leads to no significant increase in mean arterial pressure, and is detrimental in that it causes increased traumatization of the blood cells.

Central venous pressure can be maintained at normal values by gravity venous outflow, using catheters of suitable size. Constant outflow is maintained by the intrinsic resistance of the catheter, a function of its diameter, and by the hydrostatic pressure in the catheter, regulated by varying the distance from the venae cavae to the fluid level in the venous reservoir. Reducing the venous pressure to levels below normal results in no damage. Pressures above 15 mm. Hg in the superior or inferior vena cava are deleterious.

Blood volume and venous pressure are interrelated. The blood volume within the greater circulation adjusts automatically to any given venous pressure, but may be altered by vasomotor mechanisms. Total blood volume is greatly altered during extracorporeal perfusion, because vessels of the lesser circulation are no longer perfused, and blood from the intrathoracic organs arrives in the heart-lung machine to be perfused through the greater circulation. Blood loss to the machine at the onset of extracorporeal circulation is greater than can be accounted for by the volume of the lesser circulation. The reason is probably found in an increase in venous tone at that time, perhaps due to reflexes initiated by the fall in arterial pressure, mediated by the carotid sinus. Arterial pressure falls abruptly at the onset of perfusion and then subsequently rises. This rise is thought to be due to an increase in arterial tonus. There may be a rise in total blood volume after stabilization of arterial and venous pressures, presumably due to decreased venous tone.

Vasopressor substances may be administered to prevent this vasodilatation, to reduce the circulating blood volume, and to avoid overloading the heart when extracorporeal perfusion is discontinued. Maintenance of arterial tone by pharmacologic means seems reasonable when a perfusion rate of 60 to 75 per cent of the normal does not keep the arterial pressure above 70 mm. Hg.

A fall in arterial pressure, similar to that which occurred at the onset of perfusion, takes place when extracorporeal circulation is discontinued. This fall is due to the filling of the vessels of the lesser circulation and the heart, and perhaps also to decreased contractility of the heart. Postoperative overloading of the heart is to be avoided and, if necessary, vasopressor substances may be used to maintain arterial pressure in instances of this type.

—*Elmer V. Dahl, M.D.*

The Prevention of Primary Postoperative Thrombosis; a Reliable Capillary Tube Clotting Time Method. H. F. McNickle. *Arch. Surg.*, 1959, 79: 775.

The author reports his personal experience with many hundred capillary tube clotting time estimations using homemade glass capillary tubes. Gradually, by trial and error and by chance, ways were found to eliminate many of the variables in the test. The most important single factor in eliminating the variables proved to be the proper aging of the tubes before use. Smaller capillary tubes are utilized; the "beading time" is used to eliminate unnecessary cutting of the tube, and the different batches of tubes are completely segregated.

A simple routine of preoperative and postoperative clotting time estimations on adult patients undergoing major surgery was instituted in an effort to predict and forestall primary postoperative thrombosis and embolism. Prophylactic anticoagulant treatment was given when the postoperative clotting time fell to half the normal time. Heparin was the only anticoagulant used and this was given in frequent small doses by the subcutaneous route.

—*W. Foster Montgomery, M.D.*

Dicumarol Drugs and the Problem of Hemorrhage. L. B. Jaques. *Canad. M. Ass. J.*, 1959, 81: 848.

The classical indirect anticoagulant, dicumarol, was discovered by Link about 25 years ago. The pharmacology of this drug and its related compounds is reviewed. These drugs have no significant effect on blood clotting in vitro, but their effect on blood coagulation is shown by the change in clotting time measured with added thromboplastin, the prothrombin time.

In experimental animals that are given dicumarol and like drugs, spontaneous hemorrhage is rarely seen. Rabbits were kept at a prothrombin time of 10 minutes (normal 10 to 12 seconds) for 4 months without spontaneous hemorrhage. However, when the stress procedures of frostbite, insulin convulsion, or intraperitoneal injection of 10 per cent sodium chloride were applied, 50 per cent of the animals died within 60 to 72 hours. There was no external hemorrhage from nose or mouth, but the bleeding was subcutaneous, visceral, or into body cavities. Similar results were obtained with rats.

Almost identical results of death from hemorrhage were found in animals treated with stress (10 per cent sodium chloride intraperitoneally) and reserpine, but without the use of anticoagulants. It is believed, therefore, that hemostasis depends not upon a single mechanism, but upon three distinct mechanisms—the coagulation system, the platelets, and the vascular component, that is, vascular integrity and vascular response. Spontaneous hemorrhage will not occur if only one mechanism is blocked, but may occur if a combination of any two mechanisms is blocked. Thus, dicumarol drugs may block coagulation, reserpine removes serotonin from the platelets rendering them ineffective, and stress influences the vascular component. Accordingly, the following principle appears to be significant in clinical medicine: Spontaneous hemorrhage is not the natural accompaniment of anticoagulant therapy, but rather a warning of some pathologic process. Stress through its effect on blood vessels is one of the most common exciting causes of hemorrhage.

—*Emile L. Meine, Jr., M.D.*

Intestinal Bleeding and Perforation Complicating Treatment with Vasoconstrictors. Robert B. Brown, Bruce H. Rice, and Jeno E. Szakacs. *Ann. Surg.*, 1959, 150: 790.

Two cases of intestinal bleeding and perforation after treatment with l-norepinephrine are reported. On subsequent postmortem examination infarction and ulceration of the small bowel with an associated proliferative and occlusive arteritis of the intramural

vessels were found. After reviewing the literature the authors mention briefly their findings from autopsy material at the Armed Forces Institute of Pathology, Washington, D.C., and at the National Naval Medical Center, Bethesda, Maryland. Experiments on dogs using dosages of l-norepinephrine from 0.8 mcgm. kgm./min. to 2.8 mcgm./kgm./min. demonstrated that localized hemorrhages and necrotizing arteritis can be produced in the intestinal wall.

In a final comment the authors state that there is a need for further experiments to control and to quantitate these preliminary observations in terms of dosage of drugs, time intervals, degree of hypertension produced, and plasma catechol amine levels. There is evidence to consider gastrointestinal bleeding and perforation as potential complications of the clinical use of vasoconstrictors in high concentration and in patients with pheochromocytomas.

—Hans J. Schweizer, M.D.

A Method for the Clinical Evaluation of Antiemetic Agents. J. Weldon Bellville, Irwin D. J. Bross, and William S. Howland. *Anesthesiology*, 1959, 20: 753.

The authors describe a method that was followed and found useful in the evaluation of antiemetic agents. The method is simple, requires no complex equipment, and does not interfere with the normal routine of the recovery room.

The analysis of ancillary information designed to answer the question, "Does the agent lessen the severity and duration of the symptoms that do occur?" has been presented. Two measurements of response, the clinical and the mechanical, were employed to classify the severity of postoperative sickness. They appeared to measure the same thing despite a difference in theoretical approach. The ridit scale was found to be advantageous as a means for expressing these results.

The decrease in the incidence of vomiting that was obtained applies to the patient population at the Memorial Hospital in New York, New York, under the conditions of the study. These absolute figures cannot be strictly applied to other patient populations; however, it is believed that drugs that appeared superior by this testing technique will also be found to be superior in other clinical situations.

—Mary Frances Poe, M.D.

A New Approach to Fluid Therapy of the Severely Burned Patient; the Use of Urea as an Electrolyte Substitute. John A. Schilling, H. Earl Ginn, William R. Richardson, and Harold E. Dunlap. *Ann. Surg.*, 1959, 150: 756.

The authors describe the initial parenteral therapy of burn shock with 4 per cent urea in 5 per cent glucose and water as a substitute for electrolytes and water. No formulas were employed. The guides for therapy were pulse, blood pressure, and urinary output.

Upon admission each patient was evaluated clinically, and the extent of the burn was determined. The clothing was removed and the patient was placed on sterile sheets. Two polyethylene catheters were inserted in accessible veins and a Foley catheter was introduced into the urinary bladder. Blood samples were obtained for cross-matching, hemoglobin, hematocrit, and serum sodium, potassium, bicarbonate, and chloride. After these were taken, dextran in normal saline was administered in one vein. Fresh frozen plasma or whole blood was substituted for dextran as soon as it was available. No patient received more than 1,000 ml. of dextran. Plasma or blood was administered at a rate sufficient to maintain a normotensive blood pressure.

The administration of 4 per cent urea in 5 per cent dextrose was simultaneously begun in the alternate vein and was given at a rate that assured 2 to 3 c.c./min. output of urine in the adult patient, or a lesser rate, commensurate with body size, in small children. Urine samples were collected at hourly intervals. The volume, sodium and potassium content, and osmolality of the urine were measured. No effort was made to administer blood, plasma, dextran, urea, or water by formula. The clinical picture of the patient dictated the therapy. No electrolytes were given except those contained in the dextran, blood, and plasma. Oral intake of water in small frequent amounts was permitted as soon as vital signs were stabilized. A full liquid diet was started within 48 hours for each patient. This diet was discontinued and then restored if there was any residual nausea and vomiting. After control of the burn shock and stabilization of the vital signs, local care of the burned areas proceeded on an individual basis with skin grafting carried out at the earliest opportunity. All patients received penicillin and streptomycin immediately. These antibiotics were then changed to other broad spectrum antibiotics on an individual bacteriologic basis.

Approximately the same amounts of water, blood, plasma, and colloid were required as those suggested by the Brooke Army Hospital burn formulas. However, approximately one-third as much total electrolyte was administered, and the urinary output of water was approximately three times that predicted under the Brooke Army Hospital regimen.

The burned areas seemed drier, the patients responded more promptly to this regimen, and they seemed to tolerate a total oral intake much more quickly than would be expected from past experiences with other regimens. Initial and later care of the local burned area was not altered. The results in these patients warrant the further use and evaluation of this form of therapy.

—Harold Laufman, M.D.

Late Effects of Retained Missile Fragments. George Strenger and David Schwartz. *N. York State J. M.*, 1959, 59: 3967.

The authors have conducted a study of the late effects of retained missile fragments in a group of 123 unselected veterans with such lesions coming to the Surgical Clinics of the New York Regional Office of the Veterans Administration. Each case was evaluated in terms of certain objective criteria: (1) pain relieved by removal of the foreign body; (2) spontaneous extrusion of metallic fragments; (3) abscesses overlying or surrounding a piece of metal; and (4) a discharging sinus leading directly from a retained missile fragment.

In this group of 123 veterans, varying in age from 17 to 39 years at the time of injury, there were 234 wounds all resulting in the retention of metallic fragments. These fragments varied in size from 3 mm. to 2 cm. and most of the wounds were located in the lower extremities.

Of the 123 patients, only 12 presented late symptoms caused by the retained missile fragments in accordance with the criteria enumerated. Systemic effects were rare. Elevations of temperature were controlled by antibiotics. In 10 of the 12 sinus tracts developed, 8 of which were related to metal fragments imbedded in bone. Late effects occurred within 4 years in some cases and as long as 13 years after the original injury in others.

The authors conclude from their study that it would be advisable to pursue a more vigorous approach to the extraction of missile fragments from bone at the time of the original definitive treatment.

—Harvey N. Lippman, M.D.

Accidental Seeding of Cancer in the Operative Area. JOHN SONNELAND. *Northwest M.*, 1959, 58: 1687.

LOCAL SEEDING of cancer at the time of operation is an entity of recognized importance. It may be manifest as recurrence of the tumor in the operative incision or recurrence at an intestinal anastomosis.

Washings from the wound at the time of surgery have been shown to be positive for cancer cells in as high as 26 per cent of the cases studied. Examination of specimens from patients with cancer of the breast has shown that local recurrence in this disease is probably due to the accidental seeding of tumor at the time of operation rather than to local ingrowth of tumor into the skin preoperatively. Recurrences at the suture line in operations for cancer of the stomach are known to be four to six times more frequent than in those for cancer of the colon. These are a few of the isolated facts that are known about the seeding of carcinoma.

Five cases are presented to illustrate the seeding of cancer into surgical incisions. Three of the cases were colonic carcinomas, 1 was a gastric cancer, and the other was renal in origin.

It is evident that tumor-host relationships play an important part in the takes from seeding of cancer cells. The many factors which make up this relationship are poorly understood.

The prevention of seeding of tumor cells at the time of operation is important. Some of the suggestions made for accomplishing this are: (1) destroy the surface layer of the tumor whenever possible by irradiation or cauterization, (2) isolate and cover the tumor during surgery whenever possible, (3) protect wound margins by adequate draping, (4) decontaminate instruments, gloves, packs, and other fomites, and (5) irrigate the operative area with cancerocidal solutions such as Dakin's or chlorpactin solution.

—John J. Bergan, M.D.

Juvenile Aponeurotic Fibromas. ROBERT J. BOOHER and CHARLES J. MCPEAK. *Surgery*, 1959, 46: 924.

TUMORLIKE FIBROUS TISSUE LESIONS of the palms and soles of young children were first described in 1953 by Keasbey who called them juvenile aponeurotic fibromas. Although they are essentially benign tumors with self-limited growth their histologic appearance may be suggestive of malignancy, and they may recur postoperatively after incomplete excision.

The cases of 2 patients with typical juvenile aponeurotic fibromas are presented as well as those of 2 additional children with variants of this fibrous tissue dysplasia. Conservative surgical management is recommended.

—Harvey W. Baker, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Germfree Animals in Surgical Research. STANLEY M. LEVENSON, RICHARD P. MASON, TYRON E. HUBER, OLE J. MALM, and Others. *Ann. Surg.*, 1959, 150: 713.

THE GERMFREE LABORATORY of the Walter Reed Army Institute of Research, Washington, D.C., has been established to investigate the basic processes of physiology, metabolism, growth, and nutrition with animals free of known infectious agents or purposely subjected to their influence.

There are three types of germfree systems. The most widely used is a heavy steel system in which initial sterilization is obtained by the introduction of steam under pressure. A second system is constructed of lightweight stainless steel or aluminum and initial sterilization takes place inside a large autoclave. A third system is constructed of lightweight, flexible plastic films and sterilization is by chemical means. A continuous supply of fresh air is rendered free of infectious material either by a system of mechanical barriers of fiberglass filters or by a system which heats the air to 500 degrees F. Food and water are sterilized by means of an autoclave usually incorporated into the system. Heat labile materials such as ascorbic acid are presterilized by irradiation or filtration. Germfree poultry is produced from viable eggs containing chick or turkey embryo which are washed in detergent solutions and soaked in a germicide for complete sterilization of the shell, and are later hatched inside the germfree chamber.

The preferred method of production of germfree mammals is to mate germfree parents with the consequent birth of germfree young inside germfree chambers. This has been successful with mice and rats but it has not been possible to mate and raise litters of rabbits and guinea pigs in the germfree environment. Germfree mammals are initially obtained from pregnant mothers by cesarean section performed inside a specially constructed germfree operating chamber.

The term germfree at the Walter Reed Army Institute of Research means free of fungi, pleuropneumonialike organisms, and L-forms of bacteria. Some investigators have used the term "gnotobiote" to indicate the germfree animal. The normal or nongermfree animal is called the conventional animal. The most striking morphologic difference between the germfree mammal and its conventional counterpart is in the size of the cecum and lymphoid tissue of the gut. In the germfree guinea pig the cecum is often five times larger than that of the conventional animal. Volvulus of the cecum has accounted for the death of these animals in about 30 per cent of the cases. The lymphoid tissue of the intestinal tract and mesenteric nodes is

definitely less in the germfree animal and the reticuloendothelial cells are also reduced in these areas. It has been postulated that the irreversibility of hemorrhagic or traumatic shock is due to the entry of bacterial endotoxins into the circulation. If this is the case it would appear that the germfree animal would be more resistant to shock than conventional animals. But studies of hemorrhagic shock in rats and chicks have shown that this is not so.

The germfree animal offers an opportunity to study the interrelationships among specific infectious agents. For example, an ameba survived for only a few days in germfree animals with no evidence of invasion of the intestinal epithelium. When germfree animals were contaminated with Escherichia coli, ulcerative amebiasis promptly followed inoculation with Endamoeba histolytica.

The germfree animal is well suited for the study of certain metabolic problems such as the production of ammonia in cases of liver disease.

Ancillary benefits from germfree technology will be the adaptation of techniques to improve aseptic care in the operating room and wards. Patients who are particularly vulnerable to infections, such as those who have been exposed to high doses of total body irradiation, will also be benefited by the advances in this field. —*George R. Holswade, M.D.*

Wound Infections, Surgical Gloves, and Hands of Operating Personnel. E. E. SHOULDICE and C. J. MARTIN. *Canad. M. Ass. J.*, 1959, 81: 636.

A STUDY HAS BEEN MADE of the causes of wound infection in aseptic surgery for over 13 years at the Shouldice Surgery, Toronto, Canada. Only aseptic wounds for the repair of hernias and associated conditions were considered. There were 330 herniorrhaphies in the series. All the patients left the hospital 2 to 3 days after the operation. Two hundred and ninety two or 88 per cent were examined 2 weeks afterward. Thirty eight or 12 per cent were not seen again, but it is presumed that they would have returned had they had any complications.

Care of the hands was stressed. To prevent irritation from over-scrubbing, the scrubbing time was reduced to 2 minutes. A soft brush was used and green soap, followed by rinsing with isopropyl alcohol or pHisoHex, a hexachlorophene and detergent emulsion, and water only.

Swabs were taken for culture from the hands and gloves of the operating personnel. The surgeons and assistant surgeons scrubbed once before a morning schedule of four operations, with careful removal of gloves and rinsing of hands between cases. The nurses scrubbed between each case. Swabs were taken of the hands along the thumbs, fingers, between the fingers, and around the nails, palmar and dorsal, before regloving. Swabs were taken from the inside of the gloves and around punctures. All swabs were plated on 5 per cent sheep blood agar and incubated at 37 degrees C. for 48 hours. Cultures were made by the Division of Laboratories of the Department of Health of Ontario. There were no colonies of pathogenic Staphylococcus aureus.

Six mild cases of infection occurred during the experiment. Three superficial wound infections of Staphylococcus albus could be traced to the skin of the patients. The most possible source of the other infections was thought to be the nose of the surgeon. No infection could be traced to glove punctures. All cases of infection occurred in debilitated patients with low resistance. The patients were not given antibiotics preoperatively.

The patients with infections were semi-isolated in the hospital, and ultraviolet lights kept on constantly in their rooms. Any operating personnel coming in contact with them were required to wear masks and to carry out isolation technique.

From this study it is concluded that the hands and gloves of the operating personnel were not the cause of any wound infection. There was a high incidence of glove punctures due to the use of steel wire sutures, but no positive cultures were obtained from glove punctures. —*Miriam Miller, M.D.*

DUCTLESS GLANDS

The Increasing Incidence of Carcinoma of the Thyroid in a Surgical Practice. J. MARTIN MILLER, ROBERT C. HORN, and MELVIN A. BLOCK. *J. Am. M. Ass.*, 1959, 171: 1176.

A STUDY of the incidence of thyroid cancer in the past 4 years and the value of surgery in its treatment has been made at the Henry Ford Hospital, Detroit, Michigan. Between 1943 and 1953, only 34 cases were seen. Between 1953 and 1957, 83 cases were seen. This is an increase of from 3 to 4 cases a year to 16 or 17 a year. Other clinics report similarly.

The cases are divided into two groups. Group 1 comprises all patients with carcinoma of the thyroid in whom suspicion of carcinoma preoperatively ranged from "none" to "a high degree," but in whom a clinical diagnosis was not definite. Group 2 consists of those patients in whom metastatic disease was revealed or patients with local findings which left no reasonable doubt as to the diagnosis.

To account for the marked increase in incidence of thyroid carcinoma, a number of factors have been considered: an increase in the number of patients seen; more thyroidectomies in proportion to the number of clinic visits; the possibility that more thyroid patients were referred to this hospital; better pathologic diagnosis; improved clinical selection of cases for operation; greater awareness of the possibility of carcinoma in the general population; and the possibility that there has been a real increase in the incidence of thyroid carcinoma.

Careful physical examination reveals more suggestive thyroid nodules; and better criteria have been developed for removal of such nodules, without complete thyroidectomy. There has been an increase of 4 to 15 per cent in the incidence of carcinoma discovered histologically in the surgical specimens from thyroidectomies. The histopathologic appearance and diagnosis of individual cases of carcinoma of the thyroid has not changed during these years. Better public education as to the significance of a lump anywhere in the body can increase the incidence of reported cases.

The significant increase can be accounted for partially on the basis of numerous factors. The definite

increase in the number of cases of carcinoma of the thyroid suggests that it is an actual one in the general population. The physician is warned to be alert in physical examination and diagnosis, and in regard to careful selection of patients for surgery.

—*Miriam Miller, M.D.*

Normal Pregnancies in a Juvenile Hypothyroid Patient. JULIO PAZ-CARRANZA, MARTIN PERLMUTTER, and LOWEL PRIGERSON. *Am. J. Obst.*, 1959, 78: 1199.

A REVIEW of the literature reveals 6 untreated cretins who subsequently became pregnant without specific medication. The patient presented by the authors was 30 years old and had been somewhat retarded mentally and physically since birth. She had two pregnancies, both delivered by cesarean section. After her second pregnancy she began to have abnormal menstrual flow, increasing fatigability and lethargy, swelling of the hands and feet, an intolerance to cold, and constipation. She had the appearance of a cretin. She was 4 feet 5 inches tall and weighed 95 pounds. Her skin was pale, coarse and dry, and the hair was scanty. There was some enlargement of the heart and marked anemia. The thyroid uptake of radioactive iodine was 2 per cent. The protein bound iodine was 1.3 gamma per cent and the serum cholesterol 3.4 mgm. per cent. Roentgen examination revealed incomplete fusion of the numerous epiphyses with fragmentation. This woman was an untreated juvenile hypothyroid in whom acute and severe myxedema developed after a second pregnancy.

—*James F. Donnelly, M.D.*

Pregnancy Complicated by Previous Bilateral Total Adrenalectomy. WILLIAM J. ESTRADA, R. Z. HUNDLEY, J. E. NORRIS, and T. G. GREADY. *Am. J. Obst.*, 1959, 78: 1176.

THE AUTHORS present a case of pregnancy in a patient with a previous bilateral total adrenalectomy. Only 4 similar case reports are known to the authors from the literature. With improved diagnostic procedures and surgical techniques these cases will gradually become more common. Since the advent of cortisone and modern substitutional therapy for adrenal hypofunction (adrenalectomy), these patients may be expected to live longer and have greater fertility.

The patient, a 21 year old white married woman, had a normal pregnancy at the age of 17 which terminated in cesarean section because of cephalopelvic disproportion. She underwent a bilateral total adrenalectomy on 31 January 1956 for Cushing's syndrome due to adrenal hyperplasia. The patient did well with cortisone therapy and was hospitalized in June 1956 for severe nausea and vomiting early in her second month of gestation. Therapy was directed toward maintaining normal electrolyte and fluid balance. Various corticosteroid drugs were used. Upon her discharge after 16 days of hospitalization, her maintenance therapy included hydrocortisone and fluorohydrocortisone given orally. No parenteral medication was necessary. The patient was followed up in the prenatal and endocrine clinics. On 7 February 1957 the patient was delivered by repeat cesarean section under spinal anesthesia. Supportive therapy was given during surgery and the immediate postoperative period in the form of adrenocorticosteroids administered intravenously and intramuscularly. The infant weighed 7 lbs. 11 oz. and was in good condition. The patient was discharged on the eighth postoperative day.

The authors presented this case because of its rarity and also to show the relative ease with which such patients can be managed during pregnancy. They question the origin of increased urinary steroids formed in pregnancy, but reach no definite conclusions.

—*Lawrence I. Bernard, M.D.*

Primary Aldosteronism, a Review of the Medical Literature from 1955 to June 1958. PIERRE DELORME and JACQUES GENEST. *Canad. M. Ass. J.*, 1959, 81: 893.

IN THIS REVIEW of the literature the cases of 31 patients with primary aldosteronism, 12 men and 19 women, are summarized. The patients' ages ranged from 11 to 63 years, with a peak incidence of the disease between 30 and 45 years. Five cases were in children. Age incidence was the same in both sexes. There was no familial incidence.

Twenty-two of the patients had adrenal adenomas; 3, adrenal hyperplasia; 1, adenoma and hyperplasia; and 2, carcinoma of the adrenal. There were 3 patients in whom the adrenals were reported to be normal. Primary aldosteronism is always caused by adrenal hyperfunction. The adenomas typically are small, spherical, and encapsulated and have a diameter of 1 to 4 cm. in the average case. The largest one reported was 6 cm. in diameter.

There are no specific renal lesions in primary aldosteronism. Eight patients had vacuolar nephropathy, a lesion that is found in patients with hypokalemia of long duration. Ten patients had arteriolar lesions, characteristic of patients with severe arterial hypertension.

In 12 patients the onset was characterized by headache, and in 12 it was characterized by other signs and symptoms of hypertension. Polyuria, polydipsia, and nycturia were the initial symptoms in 10 patients.

All patients had arterial hypertension. Twenty-six had polyuria and polydipsia; 22 had episodes of muscular weakness; 19 had headache; and 11 had acute episodes of muscular paralysis. Other signs and symptoms consisted of paresthesias, muscle cramps, tetany, amblyopia, and pathologic reflexes.

Hypokalemia occurred in all cases. Alkalosis was present in the majority. Plasma sodium was usually decreased and chlorides were usually at the lower limit of normal. Blood sugar and calcium were normal.

Abnormalities of renal function consisted of marked polyuria and a large urinary loss of potassium. Albuminuria was usually present. The urinary aldosterone output was high in 21 of the 24 patients in whom it was measured. Urinary 17-hydroxycorticosteroids and 17-ketosteroids were normal except in patients with carcinoma. The effect of ACTH in these patients is to produce a normal increase in 17-hydroxycorticosteroids and 17-ketosteroids in primary aldosteronism.

Treatment consists of operative removal of a single adrenal adenoma by simple excision or by unilateral adrenalectomy. When bilateral hyperplasia is pres-

ent, bilateral total or subtotal adrenalectomy is recommended. When the adrenals appear grossly normal, bilateral subtotal adrenalectomy is advisable. The best surgical approach is the anterior transabdominal route by which both adrenals can be seen simultaneously.

During the first few days after surgery, large amounts of potassium should be given orally or intravenously. Cortisone, or one of its analogues, and ACTH should be given.

Postoperatively, marked potassium retention and natruresis were noted. Irreversible kidney damage was not modified by operation. Polyuria, polydipsia, and nycturia usually disappeared in 5 to 15 days. Albuminuria disappeared in most cases. The blood pressure dropped to normal, usually during the first few days or during the first month after surgery.

The primary importance of recognizing primary aldosteronism is that it belongs to that small group of causes of hypertension for which a permanent cure may be achieved by surgical intervention.

—*Frederick W. Preston, M.D.*

Studies on the Influence of Sex Hormones on the Excretion of Gonadotropin in Women (Untersuchungen ueber die Beeinflussung der Gonadotropinausscheidung beim Menschen durch Keimdruesenhormone). R. BUCHHOLZ. *Geburtsh. & Frauenh.*, 1959, 19: 851.

THE EFFECT of various sex hormones on the gonadotropin excretion in women was studied. It was found that the inhibitory action of androgens on the gonadotropic partial function of the pituitary was considerably less than is generally assumed. The effect of estrogens appeared to be substantially greater, 5 mgm. estradiol benzoate displaying roughly the same inhibitory action as 25 mgm. testosterone propionate. The effect of progesterone on the pituitary was still less marked. Even with doses corresponding to the amounts of progesterone formed in the corpus luteum under physiologic conditions, no certain effect on gonadotropin excretion was achieved. A combination of estrogens and androgens potentiated the effect of both hormones on the pituitary.

—*Werner M. Solmitz, M.D.*

The Surgical Management of Functional Adrenal Hypercorticism. ROBERT C. OVERTON, JOHN W. OVERSTREET, and RALPH V. FORD. *Arch. Surg.*, 1959, 79: 791.

ONE MALE AND 15 FEMALE PATIENTS with varying degrees of hypercorticism form the basis for this report. They were subjected to detailed examinations, including the response to intramuscular injections of 80 units of corticotrophin zinc at 30 or 60 day intervals and an analysis of urine for 17-ketosteroids. The criteria for bilateral total adrenalectomy in this initial group were (1) a more than threefold increase in the excretion of 17-ketosteroids after corticotrophin (ACTH) stimulation, with an absolute increase of 50 mgm./24 hrs., and (2) a persisting or advancing clinical syndrome in spite of accepted medical management.

Preoperative management consisted of the usual measures employed in any major surgical procedure including digitalization and diuresis in the severely edematous patient, avoidance of barbiturates to assure greater blood pressure stability, and de-emphasis of the commonly accepted preoperative priming with exogenous steroids. The upper transabdominal approach was used for removal of the adrenal glands, permitting evaluation of the genitourinary organs in the female and treatment of unrelated but coexistent intra-abdominal abnormalities. Hydrocortisone was given intravenously at the start of the operation. Supportive care after operation particularly included maintenance of normotensive blood pressure levels and adequate urinary output, principally by the administration of hydrocortisone and salt solution.

Volatile temperature responses afford a dramatic index to the necessity for more rapid administration of hydrocortisone. Persistent tachycardia indicates the patient is deficient in hydrocortisone or hypovolemic and determinations of the hematocrit and the serum and urine electrolytes are of value. The hydrocortisone is given orally as soon as possible and reduced gradually to a maintenance total daily dose of 30 to 40 mgm.

There were no deaths and the over-all clinical improvement of these patients was striking, both subjectively and objectively. The average hospital stay for the group was 9 days after operation. At the end of 3 months the average dose of oral hydrocortisone required for maintenance was 7 mgm./day.

These patients were treated at a stage in which their disease may be considered functional and not a fully developed Cushing's syndrome. Emphasis on the ease and simplicity of this form of management (total bilateral adrenalectomy) is presented.

—*Edwin J. Pulaski, M.D.*

SURGICAL PATHOLOGY AND DIAGNOSIS

Pathologic Features of Neoplasms of the Salivary Glands. MARK C. WHEELOCK, PAUL PUTONG, and JULIO TROTA. *Am. J. Surg.*, 1959, 98: 907.

THE AUTHORS present a classification of salivary gland neoplasms based on the examination of 209 cases. Photomicrographs demonstrating the characteristics of each form of neoplasm are included. The tumors were divided into two major groups, malignant and nonmalignant. The 150 tumors in the latter group were: pleomorphic adenoma 117 (mixed tumor); papillary cystadenoma lymphomatosum 21; adenoma 6 (oncocytoma); hemangioma 1; lymphangioma 1; lipoma 2; and neurilemmoma 2. The 59 malignant tumors were: pleomorphic adenocarcinoma 15 (malignant mixed tumor); mucoepidermoid tumor 11; carcinoma 19; sarcoma 9; and secondary tumor 5. About 25 per cent of the tumors were considered to be malignant, a figure similar to the findings of other investigators.

The largest group was made up of the pleomorphic adenomas, a term more acceptable than mixed tumor, which are nonmalignant but which show a marked tendency to carcinomatous change. Recurrence is rare, however, after adequate excision. The cases of papillary cystadenoma lymphomatosum are analyzed in detail. One was found to be bilateral and, while this must be regarded as a tumor on the basis

of swelling, it may well be a developmental defect rather than a new growth; one such case was seen in which malignant change had occurred. Mucoepidermoid tumors are classified as malignant tumors. The use of frozen sections is highly recommended in order to verify the clinical impressions of the surgeon prior to more extensive surgical excision, or to determine whether the neoplasm has been adequately excised. The importance of giving the surgeon a description of the histologic type of the tumor, based on the examination of properly prepared and stained sections, is emphasized. —*John R. Lindsay, M.D.*

Analysis of 500 Cases of Hemangiomas of the Skin (Hemangiomas, análisis de 500 casos de localización cutánea). José R. Piñeyro and Carlos A. Linares. *Pediat. panam.*, Buenos Aires, 1959, 4: 201.

Five hundred cases of hemangioma of the skin were collected from the Luis A. Máspero Children's Hospital and the Rawson Hospital in Buenos Aires, Argentina. Ninety per cent of the patients were less than 10 years of age when they were first seen at the clinic. In 78 per cent the lesion was present at the time of birth and in 22 per cent it appeared months or years later. Seventy-two and two-tenths per cent of the patients were females and 27.8 per cent males. The lesion was located in the head and neck in 60.8 per cent, in the thoracic and abdominal wall in 19.8 per cent, in the extremities in 14.4 per cent, and in the anogenital and sacrolumbar region in only 5 per cent.

Medical, surgical, or radiologic treatment should be instituted early. If the hemangioma is located in such areas as the lips, eyelids, or genitalia it may interfere with their functions. When hemangiomas are not treated they are subject to ulceration, perforation, infection, and malignant degeneration. There is no proof that hemangioma can disappear spontaneously; in the present series of 500 cases not a single tumor did so.

Different types of hemangiomas have been described, but for the sake of simplicity they have been classified as capillary and cavernous. Capillary hemangiomas are the most frequent and are found in the skin and mucous membranes. They represented 72.4 per cent of the total cases in the present series. The incidence of the cavernous type was 27.6 per cent. Visceral hemangiomas were not considered in this series.

The treatment in this series consisted of the following: surgery in 270 cases, radiotherapy in 155, sclerosing injections in 24, cauterization in 7, cryotherapy in 1, and other methods in 43. The treatment of choice is surgical excision of the lesion. Good results can be obtained with radiotherapy, but the hazards of this treatment should be considered, especially since most of the patients are children.

—*Rafael G. Sorrentino, M.D.*